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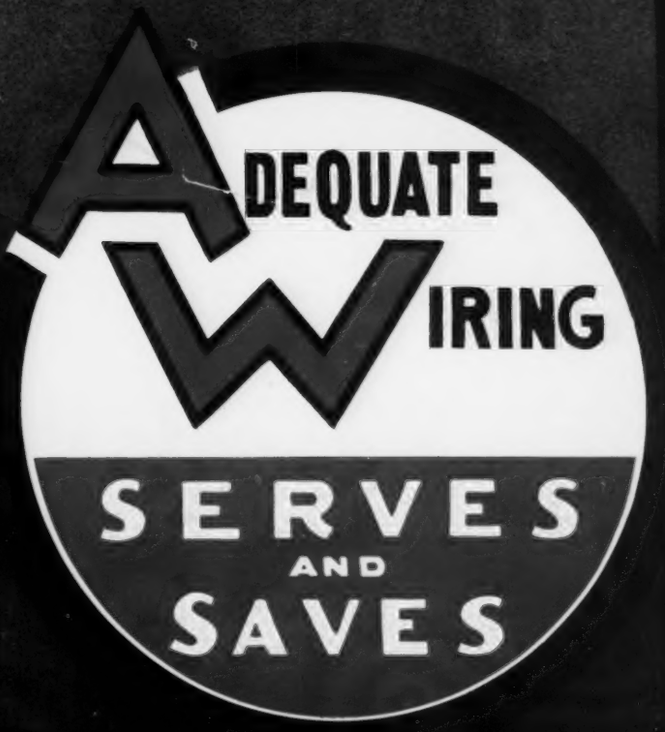
ELECTRICAL WORLD



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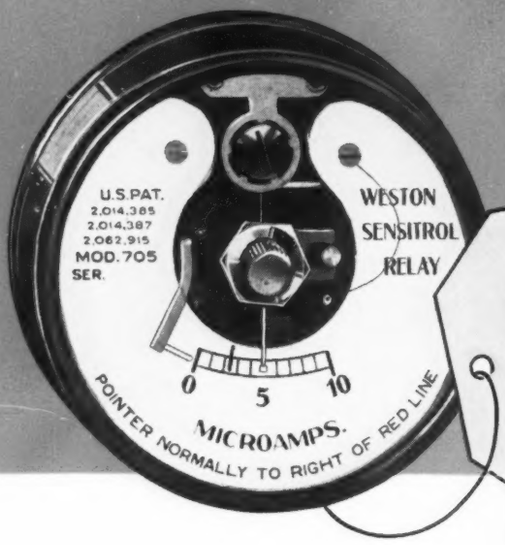
RELAYS THAT "Click" IN MODERN CONTROL CIRCUITS



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Operate from thermocouples, resistance thermometers, photocells and electronic circuits . . . provide positive control at energy levels as low as 1 millivolt or 2 microamperes . . . handle 50 milliamperes at 110 volts on contacts . . . made in hand reset and solenoid reset types.

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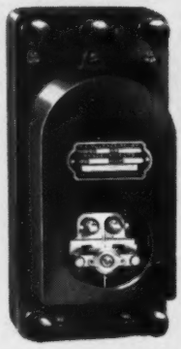
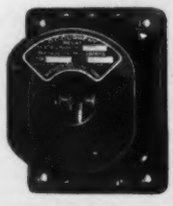


Sensitive Relays (Model 30)
Permanent magnet, movable coil operation . . . for circuits up to 200 milliamperes, 6 volts, DC . . . in types for "high-low" voltage (or current) control, and for regulation of voltage (or current) within 1%. Also "microampere" type, operating from high-side to low-side at a minimum differential of 15 microamperes.

Sensitive Indicating Relays (Model 730)
Designed specifically for alarm circuit use where current is normally held at 2 milliamperes . . . standard model serves as indicator over 0-4 milliampere range, with contacts at 1 and 3 milliamperes . . . compact and inexpensive.



Sensitive Relays (Model 534)
Compact, permanent magnet, movable coil operation . . . for circuits up to 200 milliamperes, 6 volts, DC . . . for surface or flush mounting in current relay, voltage relay or "microampere" types.

Power Relays (Model 630)
Electro-magnetic type with one to four mercury switch contacts . . . designed particularly for use with sensitive relays to supply output energy up to 1000 watts . . . operate on 6 volts DC, or from transformer rectifier unit.

No matter how limited the energy available—down to a bare 2 microamperes—WESTON Sensitrol Relays, with indicating scales, can put it to work as a means of positive control. Similarly, if operating speed, high output or some other critical element is the limiting factor, there are other WESTON Relays which meet each requirement "on the nose."

Today, as engineers and industrial executives make plans for safer, surer and more flexible means of electrified control, they design their circuits around the positive, unfailing contacts of WESTON Relays. One or more of these units is almost certain to meet your own specific needs. Why not write for a copy of "WESTON Relays"—a 12-page bulletin giving full specifications? Weston Electrical Instrument Corp., 578 Frelinghuysen Ave., Newark, N. J.

WESTON *Instruments*

Letters TO THE EDITOR

Dresden Operating Under 1 Lb.

To the Editor of ELECTRICAL WORLD:

Reference is made to the item entitled "Prominent Utility Officials Attend Dresden Steam Plant Dedication," which appeared on page 4 (1228) of ELECTRICAL WORLD News Issue, October 29, 1938. I am extremely interested in the plant, from an engineering viewpoint, and am wondering if you could enlighten me further with regard to the following items:

(a) Reference to last sentence of article, Is it 0.869 *pound* of coal per kilowatt-hour?

(b) B.t.u. value of coal used.

(c) Number of men to be employed directly at the plant—by designation, *viz.*, superintendent, engineer, clerks, furnace men, electrical men, common labor, engineers, general maintenance, etc.

(d) General subdivision of the $2,000,000 cost, *viz.* (1) land, (2) building and pertinent structures, and (3) mechanical and electrical machinery and equipment.

Any information which you might furnish along these lines will be greatly appreciated.

F. H. WOLF,
Hydraulic Engineer,
Little Rock, Ark.

The calculated performance of this station was given in the June and July issue of *Power Plant Engineering* of 1938, as follows:

Load Kw.	B.t.u. per Kw.-Hr. Gross	Net
20,390	11,543	11,966
15,580	11,756	12,299
8,990	12,745	13,753

The following are actual coal rates of the station:

March	1938	1.339
April	1938	1.037
May	1938	0.928
June	1938	0.922
July	1938	0.900
August	1938	0.926
September	1938	0.958
October	1938	0.955

The equipment has been in commercial operation since March, 1938, but it has been necessary to take the machinery down at various periods to rectify difficulties which always occur in the early periods of operation in any new plant. At the present time the superheat is 75 to 100 deg. low and the performance therefore is higher than when the temperature has been raised to the guarantee, which we expect to be corrected in the next month or two. The B.t.u. of the coal runs from 14,300 to 14,400.

The following is a list of the plant personnel: One superintendent, one general foreman, one boiler room foreman, one electrician, one test engineer, one clerk, one janitor, four plant operators, four foremen, four auxiliary operators, four switchboard operators, four to five coal and ash men, five maintenance men.

Subdivision of cost is as follows:

Subdivision of actual cost Greenidge station

Item	Description	Per Cent
1	Land	2.3
2	Power plant building	21.0
3	Other structures	12.1
4	Boiler plant	26.3
5	Turbine plant	27.0
6	Electric plant	8.8
7	Other equipment	2.5
		100.00

This station has been generally talked of as costing $2,000,000. The actual cost, however, will be approximately $2,250,000.

J. A. POWELL,
Vice-president E. M. Gilbert
Engineering Corp., Reading, Pa.

•

Suggests Federal Plants Be Held for War Reserve

To the Editor of ELECTRICAL WORLD:

Certain large preparations are being planned for national defense, which will call for the expenditure of billions of dollars. For the purpose of this suggestion it is assumed that such preparation will be made in good faith and in proportion to the danger from foreign invasion of the Western Hemisphere. One of the most important factors of such preparation is electric power. Nearly all industry is dependent on it for operation. It is flexible and motors can be readily built and applied on short notice. Not so with the generating or power plant equipment, which takes a long time to build and install.

The hydro-electric plants built and building by the federal government are supposed to function with a threefold purpose, namely, flood control, navigation and power production. If the electric energy is sold now it cannot be reclaimed in case of war. This is true because the industries which it operates will immediately become "essential industries." All industry will be essential in the next war. Nor can it be withdrawn from the lighting of towns and cities.

It is suggested, then, that this federal energy be not sold, but held in reserve for war emergencies, and the functions of navigation aid and flood control be retained for use in normal times. These functions can be performed much more fully if power is not sold.

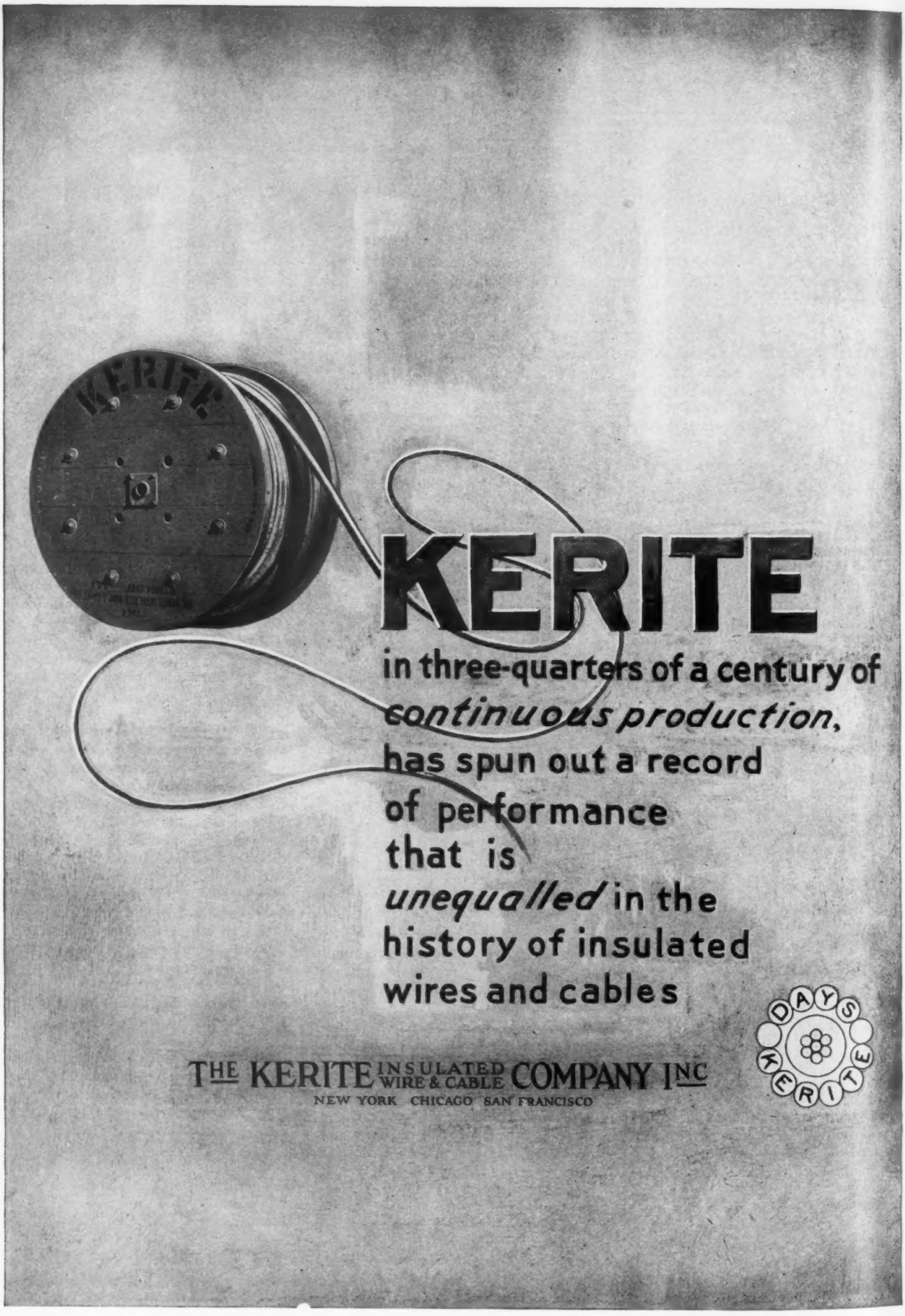
Reservoirs could be kept empty in wet seasons for catching floodwaters and full for dry seasons, when navigation must be artificially aided. The furnishing of power for normal needs would then be left to the private power companies and the federal power would form a great pool of reserve energy to be made available in time of emergency to adjacent factories or to be pumped into the networks of the private companies for more distant use.

Meantime the value of investments of millions of citizens in the private utilities would enhance in value due to the withdrawal of competition with their own government, purchasing power would be increased and private capital would flow into new investments which would and could be undertaken by the private power companies.

It is true that returns on the huge investment made by the government in these hydro-electric plants would be destroyed. This is just and proper as national defense if for the benefit of all the people and its cost should be borne by all. It would put these power plants in the same category as a fortress or a battleship. Nobody expects a battleship to haul freight between wars to help pay its cost. It might be on the other side of the world when it was needed for battle.

This plan is so simple and so obviously the right thing to do that, in my opinion, it constitutes a test of the sincerity of the government. If it desires real preparedness, this will be done. If it is not done, it would constitute evidence that the cry for "preparedness" is just another "red herring" and the real purpose is to spend other billions in "pump priming" under an assumed name.

ALBERT MILMOW,
Member of American Institute
of Electrical Engineers,
Charlotte, N. C.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ELECTRICAL WORLD

FEBRUARY 11, 1939

Signs of Peace

It has been stated repeatedly in these columns and elsewhere that until the TVA relationship to the power industry had been settled in a manner that was fair to the utilities in the area no far-reaching reconstruction and expansion program for the industry as a whole could be undertaken. TVA with its subsidized yardstick, with its policy of substituting competition for state commission regulation and with its disinclination to pay fair prices for the property of private utilities had brought about loss of confidence in utility stocks, the sale of which is necessary for any substantial construction program.

Now it begins to look as though the TVA controversy was settled. The Supreme Court by denying to the affected utilities the right to contest TVA competition, without specifically saying so virtually upheld it in its operations. Some commentators saw in this decision a green light for the government to pursue its power operations far and wide without interference. The government, however, appears in the role of not wanting to take full advantage, at the moment at least, of its victory.

Hardly had the decision been announced before negotiations for the sale of the Commonwealth & Southern Tennessee properties took on a more optimistic note. A week ago an agreement was reached whereby TVA will purchase Tennessee Electric Power at a price in keeping with the real value of the property.

The suddenness of this decision on the part of TVA to raise its price some 20 millions gives rise to the thought that perhaps the beginning of the end of hostilities between the Administration and the utilities is at hand. There are still the negotiations over certain utility property in Mississippi and Alabama which TVA wants and, of course, there is the Memphis situation yet to be ironed out. In addition, no announcement has been made so far as to guarantees with respect to territory. Should these matters be settled in a manner as reasonable as the Tennessee Electric sale, the worst barriers to construction expansion will have been removed.

There are many other indications that the war is over and that the Administration will do nothing to discourage utility spending. These are all helpful, but they can be more so if a definite policy is stated and too much is not left to political speculation.

A national power policy is needed, more so now that recovery is at hand than ever before. Several attempts have been made to draw up such a policy, but all have failed because they drew attention to conciliatory moves that government would have to make before capital could be secured for private utilities. These moves are now being made. There, therefore, would appear to be no reason why such a national policy could not now be developed.

While the utilities are by no means as much underspent in construction as many statements would seem to indicate, there is enough reconstruction and expansion that can go ahead to have a material effect upon business recovery. Billions are not in the picture, but hundreds of millions are.

The outlook for utilities is better today than it has been at any time in the past six years. Perhaps the utilities can, after all, be the industry to lead American business back to prosperity.

Modern Flexible Power for Brass Rolling Mill

Adapts Most Appropriate Steel Mill Technique— Has Combined Mechanical-Electrical Mill Drive —Special Motor Cooling—Tailor-Made Bus

By W. R. CLARK

Works Manager Bridgeport Brass Company, Bridgeport, Conn.

COMBINATION of straight line production flow with a degree of flexibility that allows metal to be readily diverted for special specification processing is a cardinal requirement in modern non-ferrous metal production. In the new $4,500,000 rolling mill of the Bridgeport Brass Company this has been attained through careful planning of layout and choice of mill-drive equipment, co-ordination of control, distribution of a.c. and d.c. power, lighting and material handling.

Briefly enumerated, the plant features include: A synchronous motor-generator set in which the synchronous motor drives not only the d.c. generator but also one of the rolling mills, a unique 1,000 hp. d.c. reversing drive for the hot breakdown mill, a special cooling system for certain important drives, grouped controls, a prefabricated d.c. bus system, modern electrically controlled tension reel drive and a flexible a.c. and d.c. power supply system.

Development of building design, supervision of construction and the installation of equipment were in charge of Stone & Webster Engineering Corporation. Morgan Construction Company, Worcester, Mass., was the consulting engineer, working with company engineers on development of the rolling mill equipment.

Power for the mill is supplied over two independent feeders (Fig. 1). One feeder consists of two 250,000-circ.mil, three-phase, 6,900-volt cables in parallel from the Bridgeport plant of the United Illuminating Company, 10,000 ft. distant. The other feeder is a 6,900-volt tie with the company's adjacent pipe and tube mill, which is served from the same generating plant. These two lines feed into a common 6,900-volt bus, from which taps are taken (1) to a bank of three 833-kva., 6,900/440-volt, single-phase transformers, (2) three 1,000-kw. synchronous motor-generator sets in the substation building and (3) one 2,250-hp., 1,000-kw. double-purpose synchronous motor-generator set at the hot and cold breakdown mills. Provision has been made for other 6,900-volt taps to be taken from this bus to care for plant expansion.

Output of the 2,500-kva. transformer bank (Fig. 1) is fed to a 440-volt, three-phase bus supplying the plant's a.c. load. Transformer sizes are such that if one unit should fail the remaining two transformers operating as an open-delta bank could supply more than 80 per cent of the mill load and thus keep major

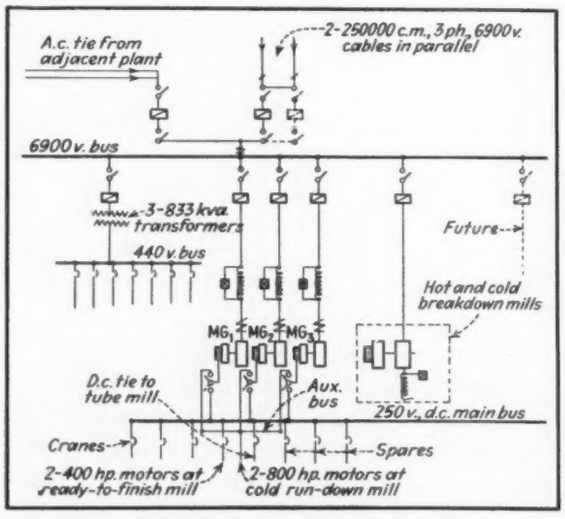


Fig. 1—Two independent a.c. feeders and an emergency d.c. tie insure service continuity to non-ferrous rolling mill

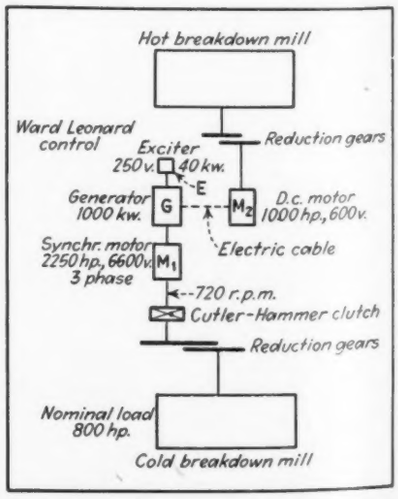


Fig. 2—Synchronous motor-generator set supplies hot breakdown mill motors with d.c. and drives cold breakdown mill mechanically

equipment operating, preventing shutdown.

Output of the three 1,000-kw. synchronous motor-generator sets is fed through double-throw switches to a 250-volt d.c. main bus, from which d.c. distribution feeders radiate throughout the plant. A double-throw switch arrangement permits any one of the motor-generator sets to be transferred from the main bus to an auxiliary bus to supply the two 800-hp. d.c. motors driving the main rolls of the intermediate cold run-down mill. The motor-generator selected is used with generator field control to supply this load.

In addition to the 6,900-volt a.c. tie line between the pipe and tube mill and the new rolling mill, a d.c. emergency tie having a capacity of 2,250 amp. at 250 volts also exists, insuring against shutdown of either plant in the event of failure of d.c. generating equipment. This is shown on the diagram (Fig. 1).

Flow of material through the rolling mill, briefly summarized, is as follows:

Slabs and bars enter the mill through an underground passageway and are delivered to the oil-fired furnace of the hot breakdown mill or directly to the cold breakdown mills as treatment demands.

After passing through the *cold breakdown mill*, slabs are annealed in a continuous walking beam furnace, cooled and transferred to slab milling units, there being milled on each side to remove surface imperfections. Bars then go to the four-high, tandem, cold run-down mills.

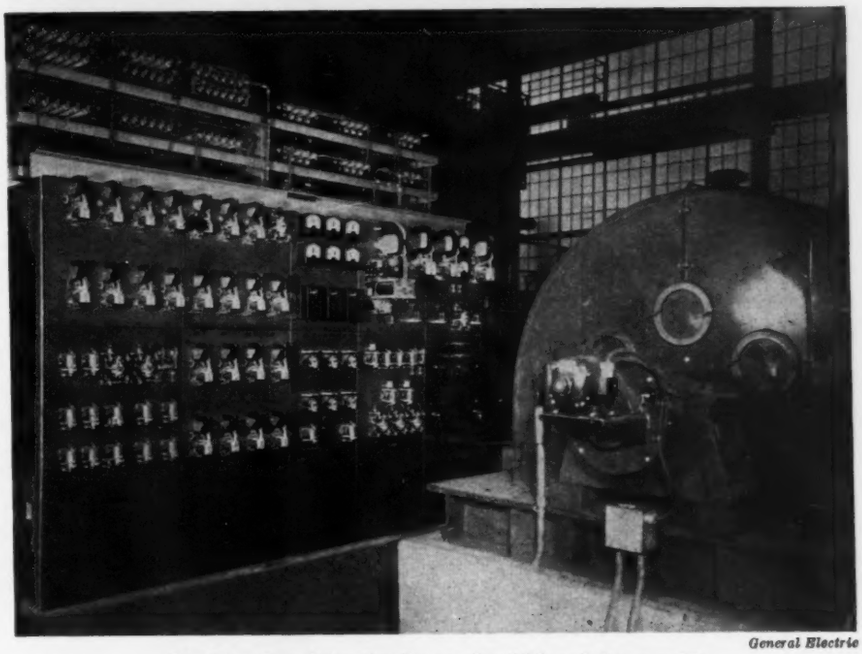
Metal from the two-high *hot breakdown mill* in flat slabs is also delivered to the slab miller and then to the *two-high, tandem, run-down mills* for further reduction by cold rolling. These mills handle either coils or flat strips.

Run-down annealing for coils from these four-high tandem mills is accomplished in a bank of four gas-fired *clean annealing furnaces*, temperature range 900-1,300 deg. F. Thence coils are passed through *continuous pickling* machines and prepared for further run-down or for finishing in the four-high, *ready-to-finish mills*. These mills have their main rolls independently driven by 400-hp. d.c. motors and one of the mills is equipped with an electrically controlled tension reel drive.

Coils from here or directly from the continuous pickling machines are rolled to finished gauges by finishing mills in an adjacent bay, and from these mills pass to still other bays for inspection, straightening, slitting, leveling, shearing, cutting to length, punching and other refining operations.

Drive for hot breakdown mills

Drive for both the hot and the cold breakdown mills centers around a synchronous motor-generator set which supplies d.c. power for driving the main rolls of the hot breakdown mill and also mechanically



General Electric

Combination drive for hot and cold breakdown mills

(Above) Air-cooled motor-generator set. Magnetic clutch and gear reduction connecting motor to cold breakdown mill are at right. (Below) Also air-cooled is 1,000-hp. reversing main drive for hot mill. Panel contains generator field control for Ward Leonard system. For description of air cooling see page 88.

drives the rolls of the cold breakdown mill. Arrangement of this combination drive is shown in an accompanying sketch (Fig. 2).

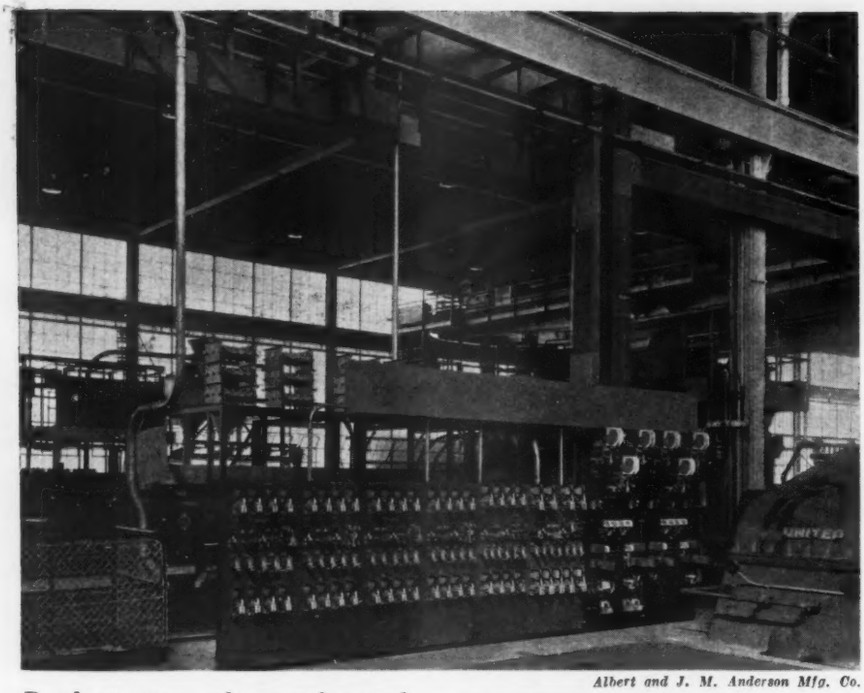
The set consists of a 2,250-hp., 6,600-volt, three-phase, 720-r.p.m. synchronous motor directly connected to a separately excited 1,000-kw., 600-volt d.c. generator. Output of the generator supplies the 1,000-hp. 0/300/375-r.p.m. reversing type, 50 deg. C motor driving the main rolls of the hot breakdown mill. Speed adjustment from 0 to 300 r.p.m. is provided by generator field control, while speeds from 300 to 375 are by motor shunt field control.

Instead of being directly connected to the mill rolls as is customary in some plants, the hot mill motor drives the rolls through a gear reduction. Use of a reduction gear in this case permitted a physically smaller, less-expensive, higher-speed motor to be used than would have been possible with a direct drive. The slower direct-drive motor of a speed adjustable type for 1,000 hp. would have been ponderous, making rapid speed changes difficult and occupying valuable production space.

Use of a reversible hot breakdown mill in which passes can be made in both directions yields the same slab reduction without resorting to a series of stands and gives the reduction in less time than a single stand and a run-around table.

Drive for cold breakdown mill

As already stated, the 800-hp. requirements of the cold breakdown mill are provided by the 2,250-hp. synchronous motor of the 1,000-kw. motor-generator set. Due to the nature of the rolling mill load a motor with a high pull-out torque (330 per cent F.L.) is used. Here



Albert and J. M. Anderson Mfg. Co.

D.c. bus system and grouped controls near cold run-down mill

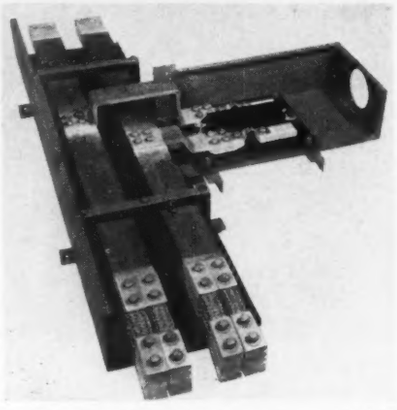
again the motor drives the mill rolls through a gear reduction with a magnetic clutch on the motor side of the gear unit to permit operation of the set with the mill idle.

With speed of the rolls fixed by the type of metal being rolled, motor speed was determined by balancing the cost of a high-speed motor against the cost of reduction gearing necessary.

Four-high cold rundown mill

All metal whether hot or cold rolled passes through the two stand four-high cold run-down tandem mill. For this reason continuity of power supply to this mill is to be desired to insure a smooth, even flow of work through the mill.

Power supply for the two 800-hp. 575/1,020-r.p.m., d.c. adjustable-speed motors driving these four-high stands originates (see Fig. 1) in a special auxiliary d.c. bus in the substation, to which any one of the 1,000-kw. motor-generator sets may be connected by a double-throw switch arrangement. When any of the sets in the substation are assigned to the auxiliary bus to supply this mill its generator field rheostat is replaced by a special rheostat controlled directly from the mill by the mill operator. Generator field control combined with motor field control provides the necessary means of adjusting speed of these two main drive motors.



Prefabricated d.c. bus system assembled on job in 20-ft. lengths

Joint services are silvered at factory, where entire duct was tailor-made. Note fuse and block and flexible braid expansion joints.

Several reasons may be advanced for the use of a separate power supply to this mill:

1. With an auxiliary bus any of three motor-generator sets can supply the mill. There is no need to rely on one machine.

2. It was more economical to use power from the sets in the substation and supply it over an auxiliary bus than to buy and install a separate set at the mill location, where space was at a premium.

3. The three 1,000-kw. motor-generator sets in the substation constitute more d.c. capacity than was needed for plant requirements. Thermal capacity of one of these 1,000-kw. sets is sufficient to carry the momentary full motor loads of the mill (aggregating 1,250 kw.) for long periods without overheating, since these loading peaks are balanced by intervals of light load.

Drive for the two four-high, ready-to-finish mills provided by two 400-hp., 250-volt, 400/1,150-r.p.m. d.c. motors with magnetic control. Electrically controlled tension reel drive is provided on one of the mills as well as on several other smaller finishing mills in a more remote part of the plant to hold tension between mill and rewinding reel constant.

Tension reel drive

Past practice in tension reel drives has been to use friction clutches to drive the tension reel, with the result that tension varied considerably as the coil was built up.

The reel drive used at Bridgeport is based on the fact that constant horsepower is required in winding material on or off a drum under constant tension. With fixed linear speed of the material being wound the reel turns slower as coil diameter increases. The resisting torque arm increases and more motor torque is needed to maintain constant tension. With the speed decreasing proportionally and torque increasing proportionally, horsepower delivered to the reel motor remains constant. If power is supplied at constant voltage, tension will be constant as long as motor current is kept constant. When the speed of winding is changed the increased net drive horsepower required is met by increasing motor voltage in proportion to the increase in speed and current is regulated as before.

In the electrically controlled tension reel drive on the ready-to-finish mills the output of a 100-kw. d.c. generator driven by one of the main mill drive motors is used to supply a 100-hp. reel drive motor. The operating speed and the current drawn by this motor are co-ordinated with mill speed and reel diameter by the tension regulator. For a desired tension the regulator is adjusted by a rheostat to be responsive to current needed for that tension. As the coil builds up on the reel, the motor must slow down and draw more current. As this current exceeds that for which the regulator is set the regulator operates to strengthen the reel motor field, bringing current back to the desired value.

[*Continued on page 123*]

Are Electric Ranges Profitable?

From Turbine to Meter, Utility Plant Necessary to Serve Electric Range Listed and Priced as Guide to Cost of Rendering Service

By H. A. SNOW

Controller the Detroit Edison Company, Detroit, Mich.

THE Detroit Edison Company serves 557,369 residence customers, of whom 56,072 use electric ranges. A year ago there were only 43,503 electric ranges. The number is increasing. We wonder if the electric range business is profitable.

Therefore in this article we have assumed a certain demand and usage for an electric range, we have listed the facilities employed for range service from turbine to meter, and next, we have attached to each item its fixed charges and operating expenses.

As a third step, we have estimated the cost of billing, merchandising and servicing the range. A discussion of overhead charges is also included, with full knowledge that policies and principles with respect to overheads must forever remain indefinite.

Finally, in any discussion of the electric range nowadays, it is necessary to consider the complementary effect of the electric water heater and we are including comments upon the combination of range and water heater.

Costs not typical

In order to avoid inane generalities our discussion of range costs is premised on data having the appearance of preciseness. The assumptions are not inaccurate, but they cannot be taken as representative of the costs of any specific utility anywhere.

With this understood, therefore, let us suppose that the modern electric range used by a family of 4.1 people of moderate income requires 939 kw.-hr. a year, or about 80 kw.-hr. per month. Suppose that a large group of ranges produces a diversified maximum demand of 0.6 kw. at unity power factor per range (at the customer's meter) at 6 to 6:30 o'clock in the evening. Of course each range will at one time or another take four or five kilowatts, but these heavy loads do not occur simultaneously. What does it cost to serve such a range?

Suppose that a good steam power plant costs $107.42 per kilowatt of installed capacity. To this add $30.71 per kilowatt for 120-kv. steel tower transmission lines interconnecting the power houses and delivering their output to a dozen load centers and for 24-kv. underground cables and switching equipment to transfer load in the event of breakdown. All of this equipment is used to deliver power at a dozen load centers ready for transmission to distributing substations.

Suppose that for the past fifteen years (constituting an economic cycle) the system peak load has averaged 70 per cent of rated nameplate capacity. This gives an investment in power apparatus per kilowatt of system load of $197.33. Suppose that, over the economic cycle, the average return has been 5.67 per cent on fixed capital (at original cost) plus working capital; suppose that average appropriations to retirement reserve for power plant property have been 2.19 per cent per year; suppose that property taxes are 1.52 per cent, and that operating and maintenance expenditures (excluding coal) are 3.11 per cent.

The total of these annual charges is 12.49 per cent of the investment, or $24.65 per year per kilowatt of system peak load. Because of the loss of energy in transmission and distribution, 1.00 kw. at the customer's meter becomes 1.29 kw. at the power plant. These figures work out to an annual cost for generating capacity of $19.08 per range, with its diversified demand of 0.6 kw. at the meter.

Suppose that the steam power plants generate a kilowatt-hour of net output for each pound of coal (13,550 B.t.u.'s), and that coal costs $3.81 a ton. This gives a fuel cost of 0.19 cent per kilowatt-hour at the power plant and, allowing for losses, of 0.23 cent at the customer's meter, or $2.16 per range per year.

H. A. Snow

Now to transmit the energy from this load center to the distributing substation. Suppose that in urban areas this is by 350,000-circ.mil and No. 00 24-kv. underground cables averaging 3.0 miles in length and that in suburban areas it is by 24-kv. lines consisting of 0.9 mile of underground cable, 350,000 circ.mil or No. 00 and 20.7 miles of No. 0 overhead. To the cost of the lines is added 15.3 per cent for 24-kv. switching equipment. Because the greater cost of underground construction is offset by the greater length and the higher maintenance costs of overhead lines we may average the two. The investment per kva. of simultaneous maximum load is $31.56. Suppose that annual costs for return, depreciation, property taxes, operation and maintenance are 12.20 per cent or $3.85 per kva. and that 1.00 kva. at the meter becomes 1.25 kva. on the transmission trunks because of losses. The annual transmission cost per range is $2.89.

Transformer costs

Investment per kva. of transformer capacity in distributing substations varies widely, even after excluding extraneous items such as railway converters and street-lighting tubs. Some substations are housed in expensive buildings on expensive sites; others are of the outdoor type on inexpensive sites. Some are large and some are small; some are fully regulated and some are not regulated at all. Some were built at times of high costs and some at times of low costs. The investment per kva. of substation transformer rating may vary from $2.68 to $35.50, but suppose that we choose as representative of average conditions $18.96 per kva. Because of spare capacity to care for growth and breakdown, average loading is taken at only 42 per cent of rating, so that the investment per kva. of simultaneous system load becomes $45.14. If we assume 14.13 per cent for fixed charges and *operating expenses*, distributing substations cost $6.38 a year per kva. of simultaneous system load. Because of losses, 1.00 kva. at the meter becomes 1.19 kva. at the substation. The annual cost for a range using 0.6 kw. at the customer's meter is $4.55.

Energy from the distributing substation is delivered to the centers of load areas on 4.8-kv. feeders averaging 1.6 miles in length consisting of 450,000 circ.mil or No. 0000 underground cables and overhead lines of No. 0, No. 2 or No. 4 copper. The underground portions of the feeders average ½ mile in length, after which the construction is overhead. Suppose that, including lightning arresters, fuses, etc., the investment per kva. of working load is $20.50, and that fixed charges and operating expenses are 11.56 per cent. This gives an annual cost for distribution feeders of $2.37 per kva. and 1.00 kva. of load at the meter becomes 1.16 kva. on the distributing feeder because of losses. The annual cost per range is $1.65.

Feeders to house

From the 4.8-kv. feeding point to the customer's house there is a network of primary and secondary mains dotted with line transformers. Construction is overhead, using largely No. 6 primary wires and No. 2 secondaries. With secondaries as heavy as No. 2, increased loading will be met by installing larger line transformers and reducing the spacing between them. For any foreseeable increase in load the overhead mains will be changed little, if any; suppose that they are unaffected by the installation of a reasonable number of electric ranges.

The investment in line transformers will have to be increased as ranges are added. In estimating the increase, two variables introduce complications: First, small transformers cost more per kva. than large transformers, and, second, more line transformer capacity per range is needed where ranges are few and far between than if closely grouped.

The assumed cost per kva. of line transformer capacity varies from $28.87 per kva. to $5.74 per kva., depending on the size of the transformer; the weighted average cost is $11.88 per kva.

Table I—Assumed Cost of Line Transformer Capacity

(Including an increment to cover spare transformers in warehouse and the cost of installation)

Transformer Rating	Cost per Transformer	Cost per kva. of Capacity
1½	$43.30	$28.87
3	52.69	17.56
5	78.60	15.72
10	127.50	12.75
15	166.77	11.12
25	239.21	9.57
50	389.54	7.79
100	573.89	5.74
Weighted average		$11.88

If the range be isolated so that its load, together with the customer's lighting load, is the only load on the transformer, the transformer must not be less than 3 kva. capacity and in many cases a 5-kva. transformer is installed. If, however, the range is one of a group of 50 ranges fed from the same transformer, the diversity between ranges reduces required transformer capacity to 0.7 kva. per range. Thus we are willing to serve 70 ranges from a 50-kva. transformer, but if there be only one range a 5-kva. transformer may be required.

The greatest extra transformer investment required by the installation of a range is for the isolated customer, a farmhouse for example. It is the difference between the cost of a 1½-kva. transformer ($43.30) installed for lighting only and the cost of a 5-kva. transformer ($78.60) for lighting and range, or $35.30. The smallest investment required is the cost of 0.7 kva. of a 100-kva. transformer, which costs $5.74 per kva., or $4.02 per range. The annual cost at 12.06 per cent may thus be anything between $0.48 and $4.26 per range. More ranges are sold in the sparsely settled districts than in the crowded districts where there is gas service. Suppose that the average increment of investment in line transformers resulting from the addition of an electric range is the cost of 1.5 kva. of a 15-kva. transformer, or $16.68. The annual cost of this investment at 12.06 per cent is $2.01 per year per range.

Copper vs. transformers

We will stick to our assumption that secondary copper remains unchanged by the addition of a reasonable amount of range load. The secondaries will be shorter because line transformers will be spaced closer, but they will not be bigger. To forestall criticism we might point out that we have already assumed the cost of distributing substations and feeders to increase directly with load. This assumption produces too high a cost for added load because a small substation or a light line costs more per kva. than a large one, so that the cost per kva. decreases as load and size increase. In the course of these surmises it is sometimes advantageous to offset one error by making another one. If we knew less

[*Continued on page 126*]

Pole Life Extended by Injection Inoculation

By J. W. SANDERS

Superintendent of Distribution, Nassau County Division, Long Island Lighting Company, Roslyn, N. Y.

SIX years ago this company was experiencing an undue amount of ground line breakage of chestnut poles that had been set out without original treatment. Decision was made (1) to continue buying only treated poles and (2) to seek a ground line treatment which, justifiable on economic grounds, would especially insure penetration at once to the core because an unusually large percentage of the weakened poles revealed internal decay.

Such a process was adopted, and in the six years which have elapsed some 32,000 poles have been treated at the ground line on a continuous program (Fig. 1). Instead of having 50 to 60 untreated poles break during each typical northeast storm, there are now no ground-line treated poles breaking during such storms and none broke solely from wind load even during the big hurricane of Sept. 21. Each pole treatment requires about two man-hours of labor plus truck time and materials cost.

Two-thirds treated

In the Nassau County division there are 83,547 poles occupied by Long Island Lighting circuits and of these the company owns 44,187 solely; included in the latter are 5,584 on transmission circuits. Since 1926 the company had installed some 30,000 poles which had been treated at the source. There were, in 1932, therefore, about 47,500 poles (practically all chestnut) which had been set untreated. About two-thirds of these have now been treated and in addition there are 3,500 Western red cedars on park and causeway lighting circuits which have been similarly treated at the ground line.

Life expiration and replacement for other causes than weakness as well as for weakness disclosed by inspection will apparently reduce the 15,000 remaining untreated poles to about 6,000 warranting treatment. In two more seasons of treatment work it is, therefore, expected that all justifiable poles will have been treated and have gained an added life for the pole system of much greater economic worth than the cost of the gang which will have been assigned to this task for about nine months in each of the six years.

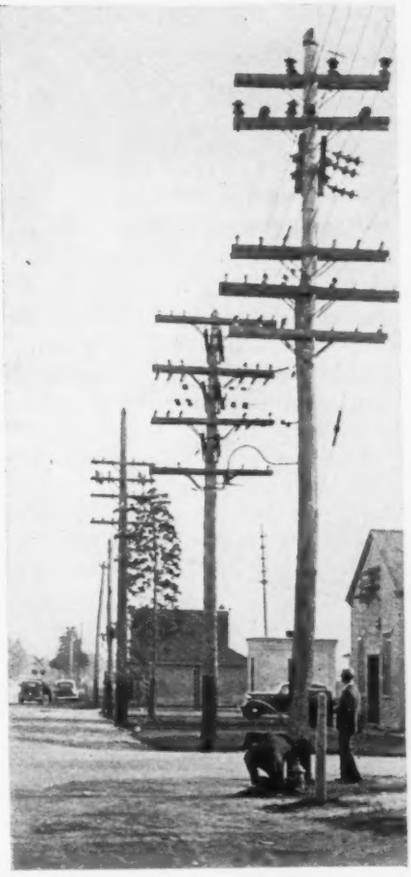


Fig. 1—After six years shows no sign of attack

This, the first pole treated (in 1932) is a 60-ft. pole at Bellmore, L. I. It shows no sign of progress of decay or termite attack six years later.

The gang consists of a working foreman, a working truck driver and four groundmen. Two groundmen travel ahead to dig away the earth for a 1-ft. depth below the ground line and then trim the pole surface to clean bright wood to a 1½-ft. high band (*i.e.*, about 6 in. above the ground line). Two men follow with the injecting tool and the remaining two give the surface a brush treatment and fill back the earth after pouring a special serum into the base of the excavation. They treat 20 to 24 poles per eight-hour day, including traveling time from their base.

Chisel penetrates pole

The injection tool (Fig. 2) has an incision chisel ⅛ in. thick which is driven into the pole bayonet-fashion by a ratchet jack after the mechanism has been clamped tightly to the pole by a ratcheted screw and nut which tightens a chain around the pole. The flat chisel separates the vertical fibers without shearing them. Grooves in its upper and lower edges afford the channels for injection of the serums by means of an Alemite (grease) gun. About four to six ounces of each of two serums is injected alternately in the four to nine insertions made around the periphery of the pole (Fig. 3), the actual number being proportioned to the size of the pole. The chisel is inserted between cracks and not in a crack. If the operator finds it enters without much pressure he knows he is dealing with a pole that has already begun to decay internally. In this way the process inherently constitutes an inspection of internal condition. The treatment is not completed for a really bad pole.

One of the serums is designed to inhibit fungus decay and the other to

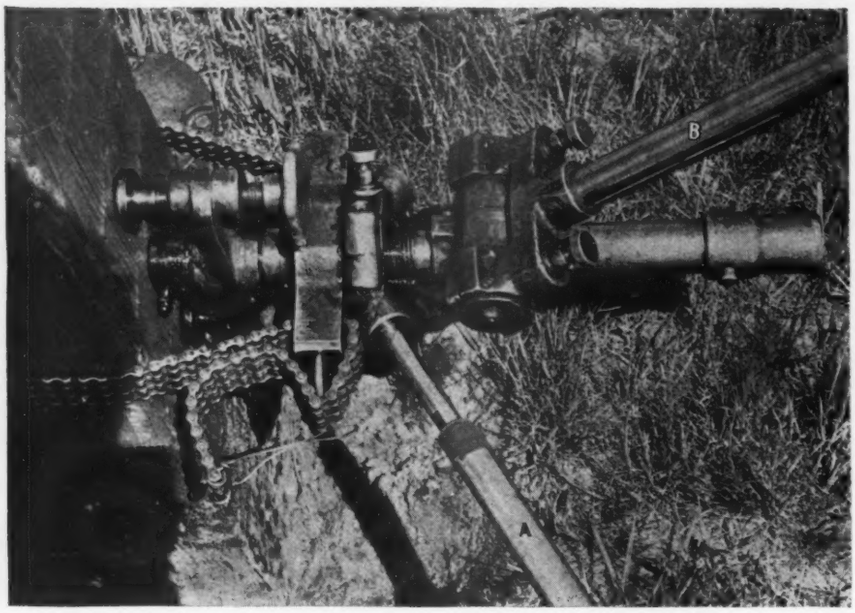


Fig. 2—Inoculation tool penetrates heart of pole

Handle A presses the tool liquid-tight against pole surface and B forces chisel into the pole

make the timber uninhabitable to termites. When the backfill pair come along one of the men gives the surface a brush treatment with a third serum having high penetrating value and then pours a half to one gallon of a fourth serum into the bottom of the hole. This last serum is merely gas oil with about seven pounds of arsenic added per barrel.

Three serums applied

The three serums applied directly to the pole are Pfister serums having toxic constituents rendered insoluble in water by special processing. The combination of penetration and insolubility in water gives an impregnant which serves to diffuse over the whole cross-section of the pole in reasonable time and in such manner and form as to preclude subsequent loss by leaching.

Before adopting this process tests were made on poles in the yards to assure that the impregnants migrated both with and across the grain and with sufficient rapidity and comprehensiveness to warrant expectation that a pole would be completely immunized in the course of one cycle of seasons. As for dominant constituents, it has long been known that dinitrophenol, creosote oil, mercuric chloride, sodium fluoride, copper oil and arsenic individually have properties in the desired direction of control of fungus and insect enemies of wood cells. In the presence of other chemicals arsenic, however, readily manifests the property of combining with them in such manner as to lose its potency for destroying termites and teredos unless precautions are taken to prevent such complications. The various serums here used contain certain combinations of these various constituents prepared in a manner which makes them emulsions insoluble in water and the arsenic retains its identity and activity.

Sustained diffusion

Of the two serums injected into the pole by means of the inserted bayonet or chisel one is designed to immunize the wood against fungus growth and the other to destroy animals prone to attack the wood. The quantities used are such that pockets remain charged with unassimilated amounts which will continue to diffuse for many years after the injection. The brush treatment affords a combination of both forms of protection in temporary form until diffusion from the core outward has provided the lasting inoculation. The fourth serum (poured into the hole) diffuses through the soil to add further temporary protection.

With these factors of confidence in the chemistry and the added appeal of a procedure which is simple and expeditious it is felt that the life of previously untreated poles can be prolonged and service reliability also enhanced to a degree which exceeds the cost incurred in the program of ground-line treatment.

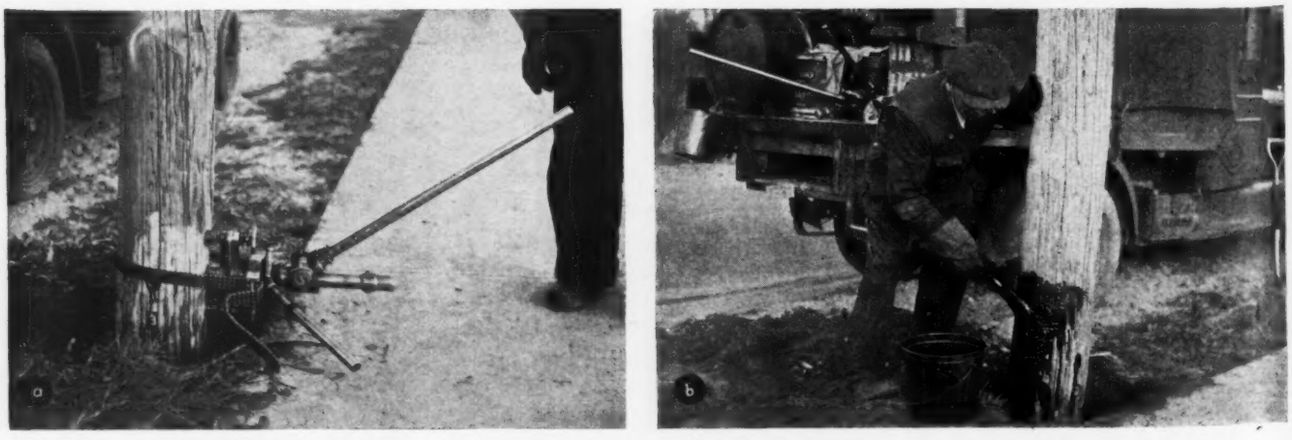


Fig. 3—Six-man gang and truck do the inoculation

Tool applies four or more injections at equally spaced points around the ground line, the number depending on the diameter of the pole. (a) One man attaches the impregnating apparatus, clamps it tight and drives the chisel into the heart. The other, foreman, applies the two serums. (b) Two others give brush treatment, pour in the gas oil and backfill when the surface dries.

Apparatus Ratings, Protection, Modernization at A.I.E.E.

STANDARDS are likely to be static, and in the face of dynamic progress they warrant revision from time to time even in their basic pattern. This realization provided the dominant theme for the program of the winter convention of the American Institute of Electrical Engineers, held in New York, January 23–27, 1939. Three consecutive sessions were devoted to laying a foundation of data and argument for revision of A.I.E.E. Standard No. 1. Many of the 1,500 who registered were at those sessions, but equally good attention was given to two sessions on protective devices, industrial electrification, switching transients, switch-house modernization, reclosing, capacitors, cable loading and instruments.

A session reviewing the utility hurricane experiences brought out the havoc of the event, but, above all, emphasized (1) the gratifying public attitude, (2) the need for a comprehensive emergency plan on each property, (3) the benefits derivable from such nation-wide standardization on materials and practices as marks the telephone industry.

In reporting the essence of the discussion on the papers devoted to the above subjects ELECTRICAL WORLD also gives herewith a brief abstract of all papers we believe to be of interest to the average reader. The combination of abstract and discussion highlights affords, it is believed, a competent cross-section of the crystallization of thought usual to this meeting.

Symposium on Rating of Electrical Apparatus

Discussion of the first group of rating papers was preceded by a statement by P. L. Alger (General Electric) which asserted that certain developments have rendered it desirable to consider shortly a revision of the basic A.I.E.E. Standard No. 1, upon which all American rating standards for electrical apparatus are founded. These are principally:

1. Recent development of new insulating materials.
2. Improved methods of determining apparatus temperatures.
3. More exacting requirements for the rating of apparatus.

The papers of the three sessions comprise the recent investigations and service experiences which would warrant such revision of the temperature limits for the classes of insulation now covered. Properties and potentialities of the new inorganic and semi-inorganic materials are canvassed for the guidance of the standards committee. Consideration is also likely to be given to the more exacting methods of utilizing inherent capacity of apparatus as typified by the recent A.I.E.E. Guide for Operation of Transformers.

Caution in the sense of conservative and evolutionary rather than revolutionary changes was expressed by many and typified by remarks of R. E. Hellmund to the effect that practices which are extra-standard but well-confirmed in practice should be recognized in the revision. There should also be more consideration given, he urged, to economic factors which guide operating practices. Progress could well be toward the international standards except where our national trend is justifiably in a diverse direction.

I—Temperature Limits of Insulating Materials

Aging Characteristics of Class A Insulation—By J. J. SMITH and J. A. SCOTT, (General Electric)

Reviews the literature since 1905, including the promulgation of A.I.E.E. Standard No. 1. Summarizes and correlates tests on hundreds of test specimens to determine rate of aging in terms of deterioration associated with (a) insulation resistance, (b) electric breakdown, (c) power factor and dielectric power loss, (d) physical condition by visual operation, (e) cracking on bending, all after accelerated aging. As for certain new synthetic materials, "it may be satisfactory for their temperature limit to be placed somewhat above class A (treated organic, 105 deg. C.), but they surely are not class B (inorganic plus binder, 125 deg. C.)."

Oil and Cellulose Insulation—By C. F. HILL (Westinghouse)

The life of cellulose insulation in oil has been investigated as a function of temperature under conditions of free access to oxygen and also in an inert atmosphere. Temperatures up to 140 deg. C. have been used. An attempt has been made also to study the life of oils as a function of oxygen concentration in an actual transformer at various temperatures. The amount of oxygen to produce a given acidity was also determined. On the basis of these data on oils an attempt has been made to calculate rates of oxygen absorption by oil which may be used to estimate the relative deterioration in transformers of other dimensions.

The results show cellulose deteriorates only mechanically, retaining its electrical properties. It is subject to both temperature and oxidation effects, the temperature effect taking place above 105 deg. C.

Fiber Glass, an Inorganic Insulation—By F. W. ATKINSON (Owens-Illinois)

Presents and discusses the data on the following properties of fiber glass insulation: Breaking strength (including subjection to heat), flexing endurance, dielectric strength (compared with cotton and asbestos), insulation resistance. From these data it is concluded that fiber glass insulation is or has: (1) Non-inflammable and highly heat resistant; (2) strong; (3) non-hygroscopic; (4) resistant to moisture, acids, oil and corrosive vapors; (5) good thermal conductor; (6) excellent on dielectric strength when impregnated; (7) high insulation resistance.

Discussion

While not prepared to recommend (as a result of the facts brought out

by these papers) a change to a 55 deg. C. standard for transformer temperature rise, nor to outlaw open-air breathing, H. V. Putnam (Westinghouse) does feel that the present standards are inconsistent in not recognizing the remarkable effectiveness of current methods of protecting transformer oil from oxidation influences. As to fiber glass, R. W. Wieseman (General Electric) stated that it was not in competitive position with mica for high-voltage winding insulation in rotating machines, but could appropriately supersede cotton for structural reinforcement. In medium and low-voltage machines it can potentially replace mica with gain in mechanical strength.

R. B. Powers (Kennecott) felt that specifications of mechanical strength need clarification and that the improvement which attends rising temperatures suggests resort to heat treatment of insulated windings to acquire this gain. Fiber glass tapes, in the opinion of G. L. Moses (Westinghouse), based on two years application in more than 50 types of motors and generators and several controls, is good for binding Class B coils and holding other forms of insulation in place, but it should not be used for main ground insulation in high-voltage equipment. Unless lubricated the fibers are vulnerable to abrasion and shear at sharp corners or edges.

What constitutes the chemical mechanism that accompanies insulation aging is something that should be more thoroughly investigated, in the opinion of V. M. Montsinger (General Electric). He does not feel that there is as yet any justification for changes in standards for Class A insulations, but he is convinced that dielectric strength is no criterion for judging deterioration in mechanical strength. He suggested that a committee be set up to standardize the methods of conducting aging tests.

In addition to the above formal papers there were informal papers on mica, asbestos and fiber glass magnet wire and "Formex" (a magnet wire with new insulation). The latter is briefly described elsewhere in this issue. R. H. Spry (Mica Insulator Co.) in his paper said that until suitable inorganic binders and impregnants are developed the best dielectrics are likely to be combinations of mica splittings in conjunction with asbestos and glass fibers.

II—Temperature Determinations

Measurement of Temperature in General-Purpose, Squirrel-Cage Induction Motors—By C. P. Potter (Wagner Electric)

As a result of comparative tests and analysis of prior investigations it is advocated that there be a revision of the standards which specify the method of measuring temperature rise of induction machines. If the resistance method (in lieu of thermometers or embedded detectors) is the sole method adopted it will be necessary also to revise the conventional allowances for hot spot and to increase the standard temperature ratings for induction machines about 5 deg. C., thus:

Ratings	Deg. C.
Open type continuous	45
Protected and intermittent	55
Totally inclosed continuous	60

Determination of Temperature Rise of Induction Motors—By E. R. Summers (General Electric)

Tests on several hundred modern induction motors (10 to 1,000 hp.) show that variations on 20 deg. C. or more are occasionally obtained by the thermometer method, depending on location of thermometer or thermocouples; resistance method of determining temperature gives relatively consistent values of temperature rise. Suggested that the standards for temperature rise measurements be revised to stipulate the resistance method be adopted for all forms of inclosed or protected machines not readily accessible for application of thermometers on laminations, insulated windings or other adjacent parts (but the embedded detector method should be retained, however, for large, high-voltage machines). Also recommended that "limits of temperature rise ultimately specified by the resistance method shall be in accord with the best interests of motor users."

Loading Transformers by Copper Temperature—By H. V. Putman and W. M. Dann (Westinghouse)

Presents new practical method of fully utilizing latent short-time overload capacity. Useful overload range for distribution transformer should extend up to five or six times normal load; for power transformers 3½ to 4 times proves satisfactory in experience. Thermal relay discriminates between useful overload and short-circuit range in CSP transformer. Signal warns of approach to high-temperature condition.

Tests raise question of reliability of prevailing methods of determining maximum temperature limits because they indicate possibility of higher short-time temperature limits than have been believed possible.

Discussion

Amplifying his paper, C. P. Potter stated that he considered thermocouples superior to thermometers in accuracy, convenience, life and reliability. However, Quentin Graham (Westinghouse) reported using the resistance method as a check on thermometer measurements and found larger differences than reported by the author of the papers. He was disposed to favor a single standard in place of the 50 deg. rise for open and 55 deg. for inclosed motors of Class B insulations. Possibly 50 deg. will be an appropriate substitute for the 40 deg. rise for Class A.

An additional difficulty not mentioned by the authors was cited by L. A. Kilgore (Westinghouse). Wind-

INSPECT E.T.L.—Among the delegates availing themselves of inspection trips was this group that visited the new laboratories of E.T.L.

ing temperatures ...ge rapidly in the first few minutes after shutdown (often 2 to 6 deg. lower than actual in one minute). An accurate alternative is to plot the curve of temperature (or resistance) against time and project the curve backward to the instant of shutdown. Graham and Kilgore were both supported by G. R. Anderson (Fairbanks-Morse) on the matter of temperature disparity. Average temperature rise in tests of more than a hundred general-purpose motor designs up to 100 hp. showed resistance to give 6.9 to 8.2 deg. higher temperatures than the thermometer. He added that industry has had no great difficulty in using the motors built to the present temperature standards even though founded on the thermometer measurement of temperatures.

On the contrary, all motors bought by Sun Oil Company are specified on a resistance thermometer determination, said Henry Thomas of that organization. He favors the recommendation of the change advocated by others, but opposes any arbitrarily fixed value of temperature differential to represent the spread between resistance and thermometer methods.

Adding to the Putman-Dann paper, the latter author said that a 5-kva. transformer had been operated for 700 repetitions of a 350 per cent overload without damaging the transformer or the temperature device or tripping the load. Putman reminded that he was not recommending the use of in-built excess capacity of transformers in regular operation, but primarily as an expedient in emergencies. Previous to this F. M. Starr (General Electric) had said that overloading was a matter of economics and that energy losses, voltage drop and revenue can be as important as thermal capacity in deciding upon degree of overloading. Most economical networks may thus dictate a loading to 75 per cent of nameplate. To him it seemed significant that distribution engineers must not impair progress by specifying unusable and unnecessary thermal capacities if a more perfectly balanced design of transformer is to be attained embodying maximum economy in conjunction with desirable operating characteristics.

At this session R. T. Henry (Buffalo, Niagara & Eastern) called attention to several departures involved in the proposed "A.S.A. Standards for Transformers, Regulators and Reactors" now about to be circulated for trial and comment. Ambient and total temperatures have little to do with rating and much to do with insulation life. Temperature rise, however, determines the material required to meet a given rating. The new standards, therefore, separate these criteria. They embrace impulse tests in addition to low-frequency dielectric tests. Insulation levels have been made the same for power and distribution transformers at 23 kv. and above. Further, the proposed Guide for Operation of Transformers recognizes the fact that life of insulation depends on duration of high temperatures. Recommendations provide for short-time overloads for recurrent conditions and higher short-time overloads for emergency conditions.

III—Principles of Rating

Electrical Machinery and Apparatus—By R. E. Hellmund (Westinghouse)

Discusses the technical, economic and psychological objectives of prevailing and the ideal rating structure. Discordances are revealed in support of recommendations that experience warrants certain specific revisions of A.I.E.E. Standard No. 1 and other standards. For example, Class B temperature (by resistance) should be changed from 75 to 80 deg. C., the IEC value; a "Class B-1 Winding Practice" should be established and provision should be made for glass fiber in Class B. Recognition should be accorded hydrogen cooling of rotating machines and oxygen-free atmospheres for transformers. The paper assembles the background and correlates the conclusions of other papers in the same session.

General-Purpose Induction Motor—By P. L. Alger and T. C. Johnson (General Electric)

The chief purpose of limiting the standard temperature rise is to protect the public from the inconvenience and loss occasioned by motors with short insulation life. Objectives of revised standards should be to specify a standard type of motor adapted for the greatest variety of applications and to facilitate the economic use of full capacity of the motor under all service conditions. Proposes revision to provide for increased values of breakdown torque and service factor in the smaller motor ratings and to incorporate definitions for permissible duty cycles. Also proposed that starting current be recognized as a convenient and accurate measure of induction motor breakdown torque or momentary torque capacity. Specific recommendations given for rated characteristics and operating limits under this starting current-temperature system of rating. Economic gains to industry from the changes are pointed out, with mention of the resultant safer wiring and control systems and a reduction in the variety of special motors.

Effects of Temperature on Mechanical Performance—By C. Lynn (Westinghouse)

Discusses other elements than insulation on active conductors. Without summarized conclusions, the paper deals with the influence of temperature on such factors as the following: *Insulating parts*—pole, brush-holders, slots, wedges, bands, commutator mica. *Materials other than insulation*—Commutator solder and copper, brushes, punching insulation, bearings. *Expansion and contraction problems*—bearing supports, squirrel cages and bars, air gaps, collector rings, shafts, centrifugal forces, vent ducts.

Higher temperatures will present new problems which point to caution in revising standards upward in any other manner than by evolutionary procedure.

Rating and Application of Motors for Refrigeration and Air Conditioning—By Paul H. Rutherford (Delco Products)

Procedure and practical results in applying single-phase motors to refrigeration compressors. Line of high torque motors developed to meet the high starting and accelerating torques demanded by the compressors. Utilization of these torques results in running loads considerably higher than rated nameplate loads, without exceeding safe operating temperatures for the insulation life requirement. Revised method of rating refrigeration motors on a starting and accelerating torque per horsepower and a starting efficiency basis is described.

Duty Cycles and Motor Rating — By L. E. Hildebrand (General Electric)

In selecting motors for duty-cycle jobs the rating and type should be chosen to fit torque requirements. Proper time rating or service factor to insure satisfactory insulation life can be determined from duty cycle. Frequent starting or reversing or starting high inertia loads imposes more temperature hazard than heavy overloads. Present horsepower ratings not satisfactory criterion of motor's reversing ability. Suggests service factors be used to indicate load duty-cycle motors can carry continuously.

Discussion

Brought out at this session, principally on motors, was the argument that rating rules and standards should take more notice of the relative margins of starting current and breakdown torques that have evolved from the now dominating temperature basis of rating. D. E. Alexander (Delco) pointed out that the general-purpose motor does not meet the needs of the refrigeration and air con-

AT A.I.E.E. CONVENTION—(L. to r.) I. W. Gross, American Gas & Electric; F. C. Doble, Doble Engineering, and H. A. P. Langstaff, West Penn Power

ditioning industry. Also, controls, fusing, wiring are too often based on an irrelevant nameplate rating in horsepower. He expects to see a large increase in 1/3- to 3-hp. motors (250,000 are now being added annually) parelleling expansion of the cooling industry and rating clarification is timely. Advocacy of the service factor method of rating was offered by P. L. Alger and L. E. Hildebrand (General Electric); H. L. Wallau (Cleveland Electric Illuminating) added that it permits a continuation of the nominal ratings to which industry has become accustomed.

F. W. Gay (Public Service Electric & Gas) related an instance of exploration where plant steaming capacity was ample but condensing water inadequate in summer. Consideration was given to a $15,000 expenditure for a 125-hp. cooling unit to lower the 87 deg. water to winter values and get a 10 per cent (5,000 kw.) increase in turbo-generator output. Differential expansion of copper and steel popped up as the deterrent cited in comment on the Lynn paper and its import.

Cable Loading

Emergency Ratings—By H. H. Kidder (Philadelphia Electric)

"Increased load ratings may represent one logical step" in the improvement of the competitive position of electricity by lowering the fixed costs associated with delivering adequate voltage and practicable continuity. Cables typify load-rating problems in general. Probably failure rate predictable. Finds frequency of high emergency temperatures low enough to warrant ten or even 300 times normal rate of life loss on such occasions. Expression for temperature transients discussed. Paper essentially devoted to economic philosophy on deriving maximum emergency loading for minimum investment.

Load Ratings — By Herman Halperin (Commonwealth Edison)

Comprehensive recital and résumé of Chicago system studies, tests, analysis and conclusions over more than a decade. Investment economies of the order of 9 per cent available by increasing rating 15 per cent through allowing temperatures to exceed the maximum of A.I.E.E. standards. Among the conclusions are:

1. During emergencies, temperatures of 5 to 35 deg. C. (depending on kind of cable) above those permitted by the rules are safe for the insulation.
2. Cracking of lead sheaths due to reciprocating cable movement into manholes may limit the temperature range for usual daily loading.
3. Cracking of sheaths in manholes due to cable movement may be reduced by improving manhole conditions.
4. For many cables a balanced design requires a lead-alloy sheath that gives increased resistance to effects of cable movement and of internal pressures.
5. Continuous field temperature surveys are essential to efficient use of large conduit and cable systems.
6. Only a small fraction of the cable ever operates at the higher temperatures.

Maximum Safer Operating Temperatures for 15-Kv. Paper-Insulated Cables—By C. W. Franklin and E. R. Thomas (Consolidated Edison)

Operation at higher copper temperatures than are accepted as normal offers one means of increasing usefulness of cable system where voltage regulation does not limit load. Major conclusions of five-year study:

1. Operation over a continuing period of load cycles to copper temperatures of 100 deg. C. of old types of paper-insulated cables which were dry and contained rosin results in a marked increase of dielectric failures.
2. Similar operation of modern well-impregnated paper-insulated cables resulted in no failures caused by dielectric heating or aging.
3. Both old types of cable and modern types of cable had an increase in the rate of failure due to wearing and cracking of the lead sheath when operated at these load cycles.
4. Occasional operation of paper-insulated cables during emergency conditions to copper temperatures as high as 100 deg. C. can be justified where a small number of sections of cable in any feeder otherwise set up loading restrictions.

Low-Pressure Gas Cable—By G. B. Shanklin (General Electric)

Critical analysis of solid type and oil-filled type cables to discern logical field of usefulness of the low gas pressure cable system described. Gives results of research and engineering study. Nitrogen most desirable gas, others being given further study. Two trial 15-kv. installations made last summer; nitrogen at 10 lb. pressure (no load); details given as to joints, potheads, gas pressure relays and profile. Suggested for steep contours and tall building risers.

Economical Loading, High-Voltage Cables, Underground — By E. R. Thomas (Consolidated Edison)

Analysis leads to the following conclusions: (1) Increased operating economies will obtain by properly co-ordinating the selection and loading of cables in specific duct banks. (2) duct banks are in general uneconomical if more than two wide. (3) construction of new underground may frequently be more economical than satisfying expansion needs through further congestion of existing facilities. (4) in general it is not economical to install cables of widely different voltage classification in a common duct bank.

Discussion

Papers and discussions at the cable session had much of the flavor of the three rating sessions, although no change in standards was emphasized. Commenting on the Halperin paper, R. I. Wiseman (Okonite) said every one agreed that cables could be loaded to higher temperatures if the working temperature could be held constant. However, we do not know (as for transformers) the correlation between loss duration and loss of insulation life. Having for years advocated an increase in sheath thickness, he was gratified by the results cited by Halperin. E. R. Thomas (Consolidated Edison) reported no trouble with a.c. sheath electrolysis in cases where sheaths were bonded to reduce sheath losses; human risks are also reduced.

The Shanklin paper evoked considerable discussion. L. J. Berberich (Westinghouse) suggested that advantageous functioning of the low

gas pressure cable attributed to sealing of ionization pockets by wax seemed to justify consideration of corona formation of waxes from the oils, especially those with aromatic compounds added. W. A. Del Mar (Habirshaw) wished the new development all success. The self-extinguishing properties cited by Shanklin were substantiated by his own tests on drained (vertical riser) cables. He, however, prefers not to agree with Berberich, but to view it as a matter of raising the ionization point. The large volume of the joints provide valuable catch basins for excess oil. As to sheaths, he foresees a reversion to alloyed lead, but not necessarily the old 2 per cent tin.

Speaking on loading trends, Del Mar rued the fact that utilities have not been buying much cable, more because of a "slipstick" frame of mind than because of "yardstick" complex. At least the papers all acknowledged that modern cables are better than those of 25 years ago.

From an operating point of view the low-pressure, gas-filled cable gives automatic supervision over sheath condition, mentioned C. W. Franklin. Experience with the two installations in New York, he said, may help to clear the situation by indicating which failures are due to dielectric collapse rather than obscure sheath breakdown.

Bus Protection, High-Speed Relays

High-Speed Relaying Experience and Practice—By RELAY SUBCOMMITTEE OF PROTECTIVE DEVICES COMMITTEE

Reviews ten-year experience. Instantaneous overcurrent relays in one company using 100 per cent setting clear 85 per cent of all faults on steel tower lines and 70 per cent on wood-pole lines. While acknowledging that the "ideal relay scheme" is still to be found, the following conclusions are drawn:

(1) The instantaneous overcurrent relay provides simple and inexpensive high-speed protection the possibilities of which have not been exhausted. (2) Distance relays are widely used and are reliable if carefully applied and maintained. But they are complex, give practically only phase-to-phase protection and not instantaneous protection for entire line length. (3) Carrier current or metallic pilot protection appears first choice for high-speed schemes whenever expense is justifiable. (4) High-speed bus protection can be successfully applied if operation of differential relays on transients is prevented.

Induced Current in Parallel Circuits and Its Effect Upon Relays—By E. H. BANCKER (General Electric)

Mysterious and obscure instances of faulty directional ground relay operation traced to mutual zero sequence reactance between parallel lines. It alters distribution of ground current and makes ground fault protection difficult. No universal, economical, remedial measure is available. Each instance calls for specific diagnosis and prescription.

Bus Protection — JOINT REPORT OF THE A.I.E.E. and E.E.I. RELAY COMMITTEE

Analysis of reports from 34 companies presents prevalence and performance data on principal types of bus protective schemes. Conclusions drawn are, in part, as follows: (1) Adequate bus protection can be obtained from either (a) differential, (b) fault bus or (c) partial differential protection. (2) While complete current differential is the predominantly favored method, a number of apparently successful schemes (applicable also to old installations) avoid the excessive expenditures of complete current differential protection. (3) General skepticism about the possible scope of fault bus protection is refuted by the considerable number of installations in service. (4) There is considerable opinion that it is unnecessary to resort to the complexity that is introduced in an effort to prevent inadvertent tripping of the bus.

Ratio Differential Relays for Bus Protection—By R. M. SMITH and W. K. SONNEMAN (Westinghouse) and G. B. DODDS (Duquesne Light)

Station bus important to protect as well as lines. Presents new bus differential relay and system test results. Conclusions drawn as to applying bus differential protection:

1. Factors involved—amount and distribution of fault currents, sizes and ratio of current transformers, number of generating sources, and, consequently, the number of restraining coils needed, relationship of protected bus to power sources as affecting the amount and extent of the d.c. component, and other important factors.

2. The use of two or more standard percentage differential relays connected in series in a particular way makes available the number of restraining coils necessary for most applications.

3. In those cases where a ratio of maximum through fault current to minimum inside fault current is large due to high neutral impedance, relays with special characteristics and reliable performance (described in the paper) are available.

Discussion

On the high-speed relaying report A. R. Warrington (General Electric) asserted that a predisposition to system transients might well render one-cycle relaying impracticable, although practical otherwise. E. L. Harder (Westinghouse) felt that the guide given in the report for freedom from current transformer transients (*i.e.*, current not to exceed ten times transformer rating) would need to be used cautiously in bus protection. It leaves the rather important variable factors of d.c. time constant and relay burden unaccounted for. The time constant may vary over the range 0.3 to 0.003, the larger time constants of 0.1 to 0.15 being typical of large generator buses.

The Indianapolis test results (1932) seemed, in the opinion of P. O. Languth (Westinghouse), to dispute the committee's assertion that no solution of potential device transients is available; at Indianapolis relays energized from potential devices gave high-speed clearing as planned. Slow operation elsewhere deserved analysis of the obscure causes. S. L. Goldsborough (Westing-

BETWEEN SESSIONS—(L. to r.) W. R. Smith, Public Service Electric & Gas; H. P. Seelye, Detroit Edison, and Frank Fowle, consulting engineer. Herman Halperin, Commonwealth Edison, is at right

Multiple grid breaker described at protective devices session
Left to Right—J. B. MacNeill (Westinghouse), operates the breaker for G. E. Decker and H. W. Tice (Southern California Edison Company, Ltd.), and A. C. Streamer (Westinghouse)

house) said the identical out-of-step blocking system used with the stepped type impedance relay carrier system can be used to provide out-of-step blocking for conventional impedance relays without carrier.

Bearing on the Bancker paper, R. E. Neidig (Metropolitan Edison) said the subject had been given too little attention, citing a case of instability between Gilbert and South Reading stations. Loop current of 108 amp. due to mutual induction had caused breakers at opposite ends of either partially paralleled line to open. Ground relays were disconnected and the system has been operating that way for six years. G. B. Dodds (Duquesne Light) cited a similar case at Colfax station. Substations fed over separate rights-of-way for reliability had trouble due to mutual induction. Until the lines could be rerouted over common rights-of-way the trouble was met by locking out the balanced relays against mutually induced currents by means of a supplementary induced current relay.

Trend toward specified accuracy of current transformers is indicated for proposed installations, said H. L. Wallau in presenting the report on bus protection. W. A. Lewis (Westinghouse), on the General Electric harmonic relay scheme, said that the scheme does not relieve the current transformer of responsibility for accuracy because if it saturates far up on the magnetization curve under the influence of a d.c. transient the transformer virtually becomes an air-cored one and practically no harmonics are developed to provide the restraining action against faults external to the bus. The most severe faults are those nearest the bus and they are the ones on which the bus differential protection is intended not to operate.

Protective Devices

A New High-Capacity Air Circuit Breaker—By L. R. Ludwig and G. G. Grissinger (Westinghouse)

A new form of deionizing arc interrupter is described which is equally effective for both d.c. and a.c. circuits. A new air circuit breaker has been designed to utilize this interrupter in which carbon arcing contacts are replaced by refractory metal and laminated brush type main contacts are replaced by silver-faced solid copper. These improvements have led to greatly increased current-carrying capacity in breakers of a given size and also large increases in interrupting capacity with a minimum of noise and flame, which permits the breakers to be mounted readily in inclosures and cubicles of small physical size.

High-Power Deïon Air Circuit Breaker for Central-Station Service—By R. C. Dickinson (Westinghouse)

The Deïon principle of arc interruption in air has been applied over a wide range of a.c. services. Difficult switching problems have been met by them. A new breaker has been developed and testd in excess of 37,000 amp. for the 15-kv. power house class. It may be supplied for masonary or steel cell mounting or as part of complete metal-clad switching equipment. Test results show breaker times of 3.8 to 5.8 cycles. Available 2.5 to 15 kv. with some applications at 24 kv.

Multiple-Grid Breakers for High-Voltage Service—By J. B. MacNeill and A. W. Hill (Westinghouse)

There are occasional demands for high-voltage circuit breakers to interrupt in five cycles or less, and to meet this demand a "Deïon Grid" interrupter has been developed which may be used in multiple unit groups for apparatus rated 138 to 230 kv. Records of field tests up to 2,250,000 kva. at 220,000 volts are given, showing interrupting times averaging 2.6 cycles (50-cycle frequency). Cathode ray oscillograms indicate a comparatively small amount of transient overvoltage, less than would be expected from the usual magnetic oscillograph records. With the fast breaker operation, the apparent system voltage dip was small, and freedom from system disturbance and loss of synchronous equipment is noteworthy.

Discussion

As pointed out by MacNeill after the discussion on his paper the first three papers covered new breaker developments for low-voltage industrial use, medium voltage utility station service applications and high-voltage transmission duty.

In amplification of the first paper C. P. West (Westinghouse) pointed out that it was now possible to house three manual three-pole, 600-volt, 1,600-amp. 60-cycle breakers (with interrupting capacity of 40,000 amp.) in drawout form in a space 26 x 90 in. Higher temperatures are permitted by the silver-faced solid contacts, which are thereby guarded against oxidation.

Arc-furnace duty was mentioned by M. H. Hobbs (Westinghouse) as an additional field for the breaker described by Dickinson. In view of the features provided, he foresees application to a number of heavier industrial and power station switchgear installations, especially where oil hazards and maintenance are handicaps. P. H. Adams (Public Service Electric & Gas) said that, after witnessing the tests reported in the paper, his company had ordered eight of the 1,200-amp., 15-kv., 750,000-kva. breakers for 13.2 kv. He hoped elimination of oil from indoor breakers could be looked for in the not too distant future. Meanwhile the present resting point appears to be 800,000 kva. for air breakers.

Pertinent to the third paper, H. A. Lott (Southern California Edison)

contributed the fact that tests on this breaker at Laguna Bell substation revealed that there was no dip in system speed and the maximum voltage dip of 5 per cent was recorded when the 2¼-million-kva. fault was being cleared in an over-all tie of 3.1 cycles. No instantaneous undervoltage release coils were reported tripped during the fault clearing. Europe, said H. P. St. Clair (American Gas & Electric Service), is going non-oil in breakers, but both the summer (1938) and winter (1939) convention programs attested the independence of the American designer in carrying forward the development of both air and oil breakers. He also welcomed the 5-cycle breaker as adequate in lieu of the unduly expensive 3-cycle breaker.

Petersen Coils on 66-Kv. System — By H. M. RANKIN and R. E. NEIDIG (Metropolitan Edison)

Three installed, only change in system insulation was one bushing. Subsequently 74 per cent of all transient faults were cleared by the coils without OCB operation. Conclusions from test and experience: (1) Suitable automatic-reopening device desirable for the short-circuiting oil circuit breakers; (2) No serious difficulty from standpoint of system relaying; (3) Modern five-disk lines give service improvement up to expectations; (4) Less improvement on older lines with pin insulators; (5) Successful operation even with coils out of tune (up to 30 per cent); (6) Breaker operations and breaker maintenance reduced.

Factors Affecting Arc Extinction on a Petersen Coil System—By J. R. EATON (Univ. of Wis.)

Correlates fundamentals of a.c. arc with system characteristics in analysis and from reported operating experience. Shows rate of rise of recovery voltage dependent on accuracy of tuning and on transient characteristics of the resonant circuit, the latter under limited control by system layout, but particularly by location of Petersen coil.

Discussion

F. H. Kierstead, on behalf of L. W. Foster, the G. E. designer of Petersen coils, added to the conclusion of the Metropolitan Edison paper the recommendation that tower footing resistances cannot be allowed to be excessive if the coils are to be effective on disturbances initiated by lightning. Since 1922 installations have slowly grown to nineteen, with four on order for 1939 installation. E. M. Hunter (General Electric) sees a trend away from overhead ground wires, which tend to make every fault to ground a short circuit. On the Eaton paper conclusion that satisfactory operation is derived even on systems having considerably different rates of rise of recovery voltage J. R. North (Consumers Power) said that recognition should also be given to three other factors—(1) the degree of complexity of the system network, (2) the voltage of corona formation and (3) the requirements for isolation of permanent faults. H. K. Sels (Public Service Electric & Gas) has been studying several hundred oscillatory disturbances and finds 80 per cent start multiphase, so presumably the Petersen coil protection would guard against only 20 per cent of the total. The feasibility, therefore, depends on the relative cost of supplementary protector tubes, involving rather extensive line changes.

Generation Switching Stations

L Street Station Switch House—By C. A. CORNEY and W. W. EDSON (Boston Edison Co.)

Modernization here means segregation. Equipment of four bus sections located in individual rooms separated by 5-ft. aisles. Lux fire protection system plus eight fog nozzles per aisle. Concrete cells and cell-type gear showed savings. Type H breakers had new explosion chambers added; cables for bus. Single-pole, stick-operated disconnects. New bus protection C.T. (G.E. Kc-59Y) with good ratio of faults. Protection differential, C.T. secondaries paralleled. Kerite and Okonite used for bus and cell wiring. Anhydrex control cable. Special 48-circuit relays for 30-40 breakers on line bus section. Mulsifier installation for transformer fire. Station auxiliary transformers pyranol-filled.

Reconstruction of Switching Facilities at Essex Generating Station—By D. W. TAYLOR (Public Service Elec. & Gas)

Extensive rebuilding prompted by space limitations, better segregation and isolation, added capacity, enhanced protection and escape from limitations of high strain-bus 132-kv. switchyard; 13- and 26-kv. buses in four sections of two group buses each with tie bus for synchronizing and load balancing. Each section has an ultimate of four power sources (two generators, one transformer bank and the tie bus). Indoors 19,000 gallons of oil in 176 breakers reduced to 660 gallons on 44 breakers still indoors. Portable CO_2 extinguishers, supplemented by fixed water spray nozzles, provided. All small indoor auxiliary power and lighting transformers now have non-inflammable fluid. Paper gives full details also on interlocks, grounding, control, protective system and auxiliary power scheme.

Modernization of Switch-House Design —By A. M. DE BELLIS (Consolidated Edison)

Presents philosophy and details of changes in process at Waterside, Sherman Creek, Hell Gate and Hudson Avenue stations. Stress is placed on following major alterations: (1) Improved physical sectionalization; (2) extensive electrical sectionalization; (3) shift to single bus scheme; (4) dust-tight metal-inclosed equipment of group phase type, each phase in separate housing (see ELECTRICAL WORLD, October 9, 1937); (5) bus differential protection and high-speed relaying; (6) ventilation segregated, water spray fire protection added, and gas seals installed; (7) power for station auxiliaries and excitation sectionalized.

Modernization of Switch-House Design —By H. E. STRANG and W. M. HANNA (General Electric)

A generating station near a load center is often a most important switching center and reliability must be correspondingly

INFORMAL DISCUSSION GROUP—(L. to r.) W. F. Davidson and H. R. Richardson, Consolidated Edison of N. Y., and H. M. Witherow, General Electric

high. Bus design should prevent access to rats and other accidental conducting objects. Gear design should minimize damage from fortuitous faults so as to support continuance of service. Protective equipment and system design require coordination if faults are not to cause severe system disturbances.

Modernization of existing installations is taking following paths (each discussed in detail): (1) Increased interrupting ability of oil circuit breakers; (2) faster operation of oil circuit breakers (especially new high-speed trip-free mechanism); (3) reduction in volume of oil (water proving promising as substitute); (4) additional safety of operators; (5) higher insulation level and phase segregation; (6) greater reliability.

Differential protection stated more prevalent than the fault-bus form of fault handling.

Discussion

Tuesday afternoon's session on power generation, from the attendance and interest manifested, was one of the most outstanding of the convention. R. L. Frisby (Kansas City Power & Light) discussing the four papers on modernization questioned the economic feasibility of spending the time and money for extensive modernization to protect against an outage that occurs once in fifteen to twenty years.

The opinion that considerable time and money was justifiable for modernization if company relations with customers was improved was expressed by A. T. P. Fugill (Detroit Edison). Regarding the Waterside metal-clad bus design described in the de Bellis paper, he questioned the need for a dust-tight design. C. M. Gilt (Consolidated Edison of N. Y.) recommended that fire walls be unweakened by doors, that scavenging and adequate drainage of high capacity be provided and that an ever-watchful eye be kept on small details in modernizing an old station.

Necessity of tieing reinforcing rods to the ground network in cases where masonry bus structures are used as at Essex station was mentioned by A. T. P. Fugill (Detroit Edison). M. H. Hobbs (Westinghouse) reported satisfactory operation was being had with metal reactor compartments. He said that it appeared more difficult to work out isolation features with masonry compartments as used at Essex station than where metal inclosures are used with the dead tank breaker as described by de Bellis.

J. G. Noest (Consolidated Edison) emphasized the importance of modernizing station maintenance to keep step with modernized equipment design. At Hudson Avenue, he reported, breakers are inspected carefully and frequently for mechanical difficulties, such as loose bolts, that are capable of making the most modern breakers inoperative. F. W. Gay (Public Service Electric & Gas) reported that tests made at Marion station (to be remodeled this year) revealed that 75 per cent of the bus support concrete inserts had a resistance of at least 1,000,000 ohms and that the lowest has a resistance of 20,000 ohms.

In discussing Hanna's paper D. H. Johnson (Consolidated of Baltimore) pointed to the need for ventilation to take out smoke and gas. As to access to fighting station fires without danger from toxic gas, he felt that water spray held the most promise.

RELAY MEN—(L. to r.) W. K. Sommerman and R. M. Smith, Westinghouse; W. A. Lewis, Cornell University; F. S. Brown and G. B. Dodds, Duquesne Light Company get together after Monday's relay session

Lightning, Capacitors, Boosters

Lightning Performance of 100–165-Kv. SUBCOMMITTEE (A.I.E.E., T&D)

Extends the 1935 summary on 220-kv. into the 132-kv. class. Tabulates answers to 71 questions and covers 150 lines of 24 companies. Major conclusions: (1) Overhead ground wires effectively reduce line outages; (2) excessive height above line wire not justified; (3) ten ohms or less desirable for tower footing resistance (in absence of discharge devices); (4) conductor height unimportant as contributing factor in outages; (5) judicious use of wood as lightning insulation offers gains; (6) double-circuit lines give low ratio of double-circuit outages to total; (7) arcing protection on insulator assemblies (not on line side) desirable to reduce line troubles.

Ultra-High-Speed Reclosing of High-Voltage Lines—By PHILIP SPORN and C. A. MULLER (American G. & E. Service Corp.)

No important high-voltage line "should be designed and installed on any other basis except on the basis of ultra-high-speed reclosing." Conclusions based on performance of eight breakers on 132-kv. lines in Indiana (thirteen out of fifteen operations reclosed without untoward incident) are, in essence, that with ultra-rapid reclosure:

(1) Lightning outages can be reduced. (2) Applied at both ends it apparently (but only apparently) reduces two-circuit flashover on double-circuit lines with ground wire. (3) On tie lines between major generating systems line flashovers have minimum effect on continuity of power flow. (4) Experience points to need for complete reexamination of switching (*i.e.*, relaying, de-energizing, re-energizing). Suggested that proper cycle of operation for standard practice is one reclosure with period of waiting seldom longer than absolute minimum of time required for deionization. (5) Results on high-voltage warrant expectation of comparable benefits in the unexplored regions of intermediate and low-voltage lines.

Secondary Vs. Primary Capacitors — By F. M. STARR (General Electric)

Comprehensive economic study of network and radial indicates secondary capacitors can be justified in practically all cases on secondary networks, but have limited application on primary radial distribution systems. Analyzes 35 overhead and 24 network situations. Other than for banked secondaries, "it is doubtful if secondary capacitors can be proved in

[*Continued on page 129*]

A Year of *Organization*

THIS presentation marks the first anniversary of the National Adequate Wiring Program, sponsored by every major branch of the electrical industry, and operated through the National Adequate Wiring Bureau, which in its first twelve months has been able, as this record shows, to accomplish results in many directions. Local activities are actually under way in 200 centers, while in 114 utility companies definite programs are being carried out. Some of these results are indicated in the following pages.

In appraising these results, it must be remembered that this was a year of organization. It was a period during which the industry itself had to be sold upon an organized approach to the problem. It is gratifying to see actual results in a growing volume of certified homes, but it is much more gratifying to see the number of local communities that are beginning their period of self-education in a unified program.

This is not the first time the industry has attempted an adequate wiring program. Years ago Red Seal wiring was started in several cities and in some cities it still continues. The effort, however, never made the progress that it should, largely because of lack of unity of purpose and lack of strong, energetic utility backing.

Locally, this is not solely the problem of the manufacturer, or the wholesaler, or the inspector, or the dealer, or the contractor. Since it is a definite barrier to load growth, it has now become the problem of the utilities, and they alone can solve it. The present program, fortunately, has utility support, but it will need more than mere support to continue its effectiveness year after year to the point where every building is adequately wired. It will need active utility participation, guidance, sympathetic understanding, money, man-power.

Material in the following pages gives vivid evidence of what can be accomplished by active utility promotion of adequate wiring in the home, the office, and the factory. It is but a drop in the bucket to what can and will be accomplished when more of the utilities realize their place in the picture and devote attention to the problem in the measure that it deserves.

The National Adequate Wiring Bureau and the electrical industry, particularly the utilities, are to be congratulated on the superb progress made in the first year. If the year of organization is any measure of what can be done, the results in succeeding years should be out of all proportion to the modest amount of money invested in this activity.

The FIRST YEAR of the National Adequate Wiring Bureau

By W. E. SPRACKLING
Chairman National Adequate Wiring Bureau

I AM PLEASED to take this opportunity to express to the utility companies which are co-operating in this broad program the thanks of the many branches of the industry interested in the progress of the Adequate Wiring program.

As the focal point of local electric progress in the communities of the nation, our utilities deserve a full measure of the credit for the highly satisfactory progress made to date.

I know the program will be successful if the utility companies will only continue to direct and encourage the long-range promotion and support which have distinguished their present efforts.

During this first year the national bureau has been exerting its efforts to promote and popularize the acceptance of adequate wiring on a nation-wide basis, to pave the way for the intensive localized efforts of the many co-operating utilities.

A few of the highlights of this work during the past year are as follows:

ACCOMPLISHMENT

Local bureaus and programs are being conducted from approximately 200 centers to serve territories which vary greatly in size. Many city-wide programs are carried out to county and surrounding areas, while other city programs extend over state-wide marketing areas.

CERTIFICATION

Twenty-one cities now licensed to operate certification features of the plan. Other activities involving organization meetings of allied groups, plans for procedure, etc., are under way. Inquiries to date from more than 600 communities, which is an index of the ever-widening circle of interest.

UTILITY PROMOTION

Local promotion of Adequate Wiring programs now under way in 114 utility companies serving more than 12,500,000 residential customers. Some companies have been active for a number of years, but nevertheless these 114 companies now active serve 53.5 per cent of the nation's domestic customers.

FIELD REPRESENTATIVES

Two field representatives of the national bureau have traveled thousands of miles in the past twelve months to assist at 153 organization meetings located in 44 of the 48 states. Acting as liaison agents between the local organizations and the national bureau these men constitute a valuable source of mutual information and helpfulness.

CO-OPERATIVE AGENCIES

In first year co-operation secured from governmental bureaus, such as Electric Home and Farm Authority, Rural Electrification Authority, Federal Housing Administration and Home Owners' Loan Corporation. With other agencies, results have materialized in demonstration homes, financing service, educational and publicity campaigns.

SPEAKERS' BUREAU

Well informed on the national need for Adequate Wiring are 107 representatives of all branches of the industry located in 30 states who offer their time as spokesmen at meetings. Their time is made available for meetings which can be fitted into their itineraries.

NEWSPAPER ON WIRING

"The National Adequate Wiring Reporter," published six times per year, reports local bureau progress to associates, leagues, utilities and others interested in the purposes and progress of the program. Complete accounts of local programs are printed, together with details as to their conception and execution.

PUBLICITY SERVICE

Just short of one million pieces of publicity and promotional material have been ordered from the field and sent out by the bureau. Radio spot announcements and continuities, lecture material for customer groups, electrical contractors and technical schools are included.

INSTRUCTION COURSES

Educational programs are under way, and already in operation in at least a half dozen cities. These inform contractors, salesmen, wiremen and other electrical industry representatives of the details of the program and of their means of application.

ARCHITECTS AND BUILDERS

Stimulated by the special A.I.A. booklet issued a year ago utilities are paying particular attention to architects and builders in their areas. These groups carry great influence in the direction of new home development which sets the pace for older homes.

SHOWS AND EXHIBITS

Actual demonstrations of adequate wiring are gaining popularity as a means of bringing the subject to the attention of the "man in the street." Homes comprising the Town of Tomorrow at the New York World's Fair will be wired under our sponsorship. At the Golden Gate International Exposition a robot will answer questions regarding adequate wiring.

The Significance of ADEQUATE WIRING to Utility Companies Today

REPORTS from numerous utility companies, located in every sector of the country, unanimously emphasize the extreme importance of adequate wiring to utilities today. Holding adequacy to be essential and a deciding factor in load-building progress, utilities are undertaking informational campaigns which embrace practically all promotional media.

Residential, commercial and industrial installations of adequate wiring are being stimulated by utility leadership and sponsorship during 1939 of joint newspaper advertising, joint mail campaigns, meetings for contractor groups and for architects, wiring demonstrations and exhibitions, sound films, training courses and co-operation with E.H.F.A. financing plans.

Organizing further for the long-pull job, utilities are now equipping contact employees to carry the gospel of adequate wiring into the homes of customers.

Heart Plan—Utilities are constantly promoting load-building activities from Pin-it-up lamps to refrigerators. The use of these units is dependent upon adequate wiring. We feel that the wiring system is the heart plan because the utilization of electricity hinges on the adequacy of wiring.—WESTERN UNITED GAS & ELECTRIC CO.

Bottle-neck—It is a fact, monstrous and amazing, that while the central stations have been built throughout our country with enormous capacities and while the various appliances for utilization of this capacity have been perfected and sold in relatively high saturation, the flow of kilowatt-hours is completely determined by the size wires, or shall we say the bottle-neck between the supply and the market. Therefore the significance of adequate wiring to the public utility is all important.—PUBLIC SERVICE CO. OF OKLAHOMA.

Wiring, Outlets—We, of course, are aware that poor wiring and inconvenient outlets serve as a bottle-neck for our service. Therefore we are vitally interested in adequate wiring and have been recommending proper wiring in both our commercial and home-lighting departments for several years.—DAYTON POWER & LIGHT CO.

Required Promotion—We have approached the subject of adequate wiring as being a required part of our sales promotional activities; selling load-building appliances will produce revenue only when provisions are made for the use of the appliances sold. Conveniently located outlets promote more frequent use of electrical appliances. Adequate capacity will assure more satisfactory operation. Together they will provide revenue in quantity governed only by the need the customer may have for the service his appliance is capable of rendering—KANSAS GAS & ELECTRIC CO.

Barrier to Use—The answer to this condition is obvious. Inadequate wiring is today one of the main barriers to increased kilowatt-hour consumption and this is especially true in industrial and commercial lighting activities.—SOUTH CAROLINA POWER CO.

Help Sales—Wherever adequate wiring is installed, we are able to sell additional appliances that heretofore could not be sold due to the inadequate condition of the wiring in the home. We have no definite figures at present to prove the statement and we feel sure that additional usage is resulting from adequate wiring promotion in our territory. We do have state-wide figures, however, on all new appliances that are being sold over the territory from which we estimate additional usage and additional revenues are received, due to the advantages of adequate wiring promotion.—MISSISSIPPI POWER & LIGHT CO.

Increase Revenue—Adequate wiring would automatically increase utility revenues enormously, by (a) providing proper lighting and power voltage at the point of use and (b) providing proper outlets in enough places, the usage of all appliances will definitely increase.—DELAWARE POWER & LIGHT CO.

Adequacy Essential—Adequate wiring is essential in order to supply the proper voltage to equipment being used by the customer. If the equipment being used by the customer is supplied at the rated voltage, the desired net results are best. This will be found to be true whether the current is being used for lighting, power or heating, especially lighting and heating, since the efficiency of the equipment used will drop rapidly in case of a lower voltage supply than for which the equipment is rated.—LUZERNE COUNTY GAS & ELECTRIC CORP.

Deciding Factor—This program will eventually mean the ability of utilities to pick up additional load which in the past has been lost due to the cost of rewiring. In many cases this cost has been the deciding factor in installation of additional lighting and commercial cooking appliances in commercial establishments. No figures are available regarding the residential field; however, many toasters, etc., are sitting on shelves, due to the lack of a convenient outlet. Utilities should take the initiative in promoting a campaign of this type.—APPALACHIAN ELECTRIC POWER CO.

Customer Satisfaction—Remove the bottle-neck of limited wiring capacity which in many premises is more or less a barrier to progressive load building so essential to full use of proven electrical service. They are so economical to operate. An important feature of adequate wiring is improved customer satisfaction and use of service and appliances.—PUGET SOUND POWER & LIGHT CO.

Opens New Outlets—It increases load by opening up new outlets for added merchandise sales and increased wattage. Better

satisfied customers as they obtain full value that they are now paying us for.—FORT DODGE GAS & ELECTRIC CO.

Means further use of appliances as we find that the need for adequate wiring is daily becoming a big problem with us.—NORTHWESTERN PUBLIC SERVICE.

Halts Load-building—Adequate wiring is of importance to utilities because present wiring conditions and practices represent a bottle-neck in so far as load-building activities are concerned. We have 1939 customer acceptance on standards of lighting, air conditioning, electrical appliances, etc., but 1919 wiring conditions upon which to operate.—GULF STATES UTILITIES CO.

Progress and Plans of Utility Companies

Public Benefits—Our campaign now in progress to see that the public reaps all the benefits offered by adequate wiring involves many methods of promotion. Literature of various types, display posters, newspaper space, lectures, demonstrations and an adequate wiring emblem all fit into their niches in the program. In the campaign we are using the architects' specifications for adequate home wiring, the handbook of interior wiring design and national specifications for adequate wiring featured by the Adequate Wiring Bureau. A number of other booklets also are being used in the drive.—DALLAS POWER & LIGHT CO.

Long-Pull Job—A notable acceptance of No. 12 wire by commercial customers has been noted with respect to branch circuits in adequate service capacity where and when we personally recommend the same. With respect to our residential results, we feel that the average customer is not yet educated to demand adequate wiring. It is a long-pull educational job.—GULF STATES UTILITIES CO.

Two Certificates—Upon the announcement of new residential projects a copy of our residence wiring guide is immediately mailed to the prospective owner. This booklet explains the need for adequate wiring and, by means of simple diagrams and tables, shows what constitutes adequate wiring in a manner that the layman can readily understand. Our service in preparing layouts and specifications is described, as is the Red Seal certificate which our Company applies to houses which measure up to definite standards of adequacy.

Following the mailing of this booklet to the individual owner, active solicitation is made to the architect or builder for permission to prepare the wiring layout. When the wiring plan is finally decided upon, solicitation is made for permission to erect an adequate wiring sign on the property during course of construction, and when completed, a certificate of adequate wiring is issued to the owner.

Certificates of two kinds are used indicative of the two standards of wiring adequacy which we have found necessary to recognize in this promotion. The Red Seal standard certificates are issued where the wiring and number of outlets are just sufficient to meet the minimum requirements. Blue Seal Superior certificates are issued when the house embodies the additional number of outlets which our lighting engineers consider essential to complete electrical convenience with a measure of provisions for future needs.—CONSOLIDATED GAS, ELECTRIC LIGHT & POWER CO. OF BALTIMORE.

Contractors' Meetings—A most successful adequate wiring school was held in Miami during May and June, 1938, and for 1939 we expect to engage in more promotional work and effort. For example, beginning Monday night we hold the first of a series of twelve system meetings for contractors and others interested in adequate wiring. This series of meetings will be held in the more important of our key cities from now until March 1. Adequate wiring is a component part of our 1939 sales program and necessary promotion and publicity will be strenuously extended toward its furtherance.—FLORIDA POWER & LIGHT CO.

Club Advertising—A committee of the Pawtucket Central Falls Electric Club is now working on a program to present to the club for approval in the near future. When such a program is adopted by the club we shall support it actively. To date, however, our activities have been limited to running a series of newspaper advertisements over the signature of the Pawtucket Central Falls Electric Club and the company.—BLACKSTONE VALLEY GAS & ELECTRIC CO.

Promotion of Adequate Wiring will be conducted by salesmen, assisted by as much newspaper and other advertising as we can afford to use.—NORTHWESTERN PUBLIC SERVICE.

Missionary Work—We have done considerable missionary work among architects and builders during 1938 and we are hopeful that 1939 will warrant more active participation.—CENTRAL ILLINOIS ELECTRIC & GAS CO.

Commercial Progress—Adequate wiring program has been slow getting started in our city as our local electricians are not organized into an electrical league. Our electrical engineer has been sucessful in attaining additional wiring in the commercial field and increased lighting load has been promoted very successfully in the past year. We shall attempt to organize electricians into an electrical league and building program to take in residential promotion as well as commercial promotion.—FORT DODGE GAS & ELECTRIC CO.

Active Seventeen Years—We have been doing many of the things included in the adequate wiring program for the past seventeen years. I refer more particularly to the work in new buildings and

most of us
build a home
only once
and we want it to be good
After we move in and do not find enough places in which to plug our lamps, no switches where they ought to be, and so on, it will be difficult to do anything about it.
The Electrical League offers a booklet, "Certified Adequate Wiring," which can protect you against this sort of condition. It is designed primarily to guide home builders in their wiring plans. You will profit by reading this booklet. Compare its wiring specifications with your plan. If you wish we will gladly check your wiring plan for you. Just call Daly 6600, extension 304, Wiring Service Bureau. No charge. No obligation. We just want to be sure that you get Certified Wiring adequate for your needs.
Electrical
SEND FOR COPY OF THIS BOOKLET TODAY!
W1-14
THE ELECTRICAL LEAGUE OF MILWAUKEE

THE UNIVERSAL APPEAL—Pride of ownership and protection of customer investment are used to sell Adequate Wiring in Milwaukee

especially new homes. We have made several attempts to improve wiring in old residential buildings, but up to this time we have not found a way to do the job at a cost that is in line with the results that may be obtained. We will continue to contact per-

sonally architects, building contractors, banks, real estate operators, building managers and others and will also continue the plan service on our direct mail program.—CLEVELAND ELECTRICAL LEAGUE.

Three Fields—So far the program has been operative in a definite way in Seattle only and has been confined to the residential field, but it is having its influence in the commercial and industrial field as well as in farm electrification. Further consolidation of present progress will blossom forth on a certification plan and additional employee activity to get the story before those prospective builders of new and modernized homes.—PUGET SOUND POWER & LIGHT CO.

Employee Activity—Several advertisements have been run in co-operation with the local electrical league and our new-business department has stressed adequate wiring with prospective builders in personal contact work.—APPALACHIAN ELECTRIC POWER CO.

Engineers Guide—It is the present practice of the company to help any customer with his wiring problems in order that best results may be obtained. All complaints are investigated by lighting engineers of the new-business department and recommendations made to improve the existing conditions. The services of a lighting engineer are available to any customer.—LUZERNE COUNTY GAS & ELECTRIC CORP.

Home Advisers—Much more general acceptance of Adequate Wiring Bureau standards of wiring and no noticeable trend away from the minimum of underwriters. There are many more specifications for No. 12 minimum wire. We shall continue our efforts through lighting and power sales departments and our residential work through the home-lighting advisers and our architectural contacts.—DELAWARE POWER & LIGHT CO.

Lectures, Visits—We have found that the bulk of our new building is by developers and that the competitive situation in the lower price building field means that houses are being wired with a greater number of outlets and with more attention to the size of conductors. Our lighting engineers and home service bureaus are stressing this in all their calls and lectures and it will be continued through 1939.—LONG ISLAND LIGHTING CO.

Where do we go from here?
NOW COMES E.H.F.A. Helpful plan for adequate wiring -
E.H.F.A. ADEQUATE WIRING
BARN
FARM HOUSE
GARAGE
HOME
WASHINGTON
FIRST OFF THE REEL, we must provide the lowest possible rates as a prerequisite to the maximum use of electricity.
NEXT we must make it easy for our customers to buy the appliances and equipment so that they can obtain the benefits which come from a liberal use of electricity.
THE THIRD STEP involves the "bottleneck" through which the kilowatt hours must pass — your electric wiring.
LOW RATES, easy-to-buy terms for appliances, and adequate wiring financing make a vital circle of benefits for our customers—but we're never through! We are constantly trying to do better by you.
SALES MEAN JOBS
OUR PLEDGE—
FRANK McLAUGHLIN, President
PUGET SOUND POWER & LIGHT COMPANY
"To Best Serve the Public Interest"

E.H.F.A. FOR PUGET SOUND—Puget Sound Power & Light—The sixth and latest utility to tie in with E.H.F.A. wiring plan—uses Reddy Kilowatt to tell the folks all about it.

Joint Meetings—In our territory we have secured the co-operation of local dealers, electrical contractors, architects and lumber yards in advocating improved wiring. We have been able to hold meetings with the local contractors, electricians and architects. At the same time we give the customer the benefits of adequate electric service. Our home service department presented the adequate wiring story in connection with its annual cooking school in nineteen different towns for a total of 48 days last summer.

We have published a book called "Adequate Wiring Hints" that is being sent to all architects, electricians, building contractors and local lumber yards; also to individuals who contemplate new construction or rehabilitation of their present building. This booklet is now in its second printing. We have made no attempts on organizations to promote adequate wiring other than by personal appeal to our customers and various agencies who co-operate with us in our promotional work.—MISSISSIPPI POWER & LIGHT CO.

E.H.F.A. Helps—While we have made arrangements to extend the E.H.F.A. finance plan to wiring contractors in our territory, the E.H.F.A. representatives, assisted by us, have not yet completed a canvass of such contractors. While quite a number have been approved, we are deferring launching this activity until this job is completed.—PORTLAND GENERAL ELECTRIC CO.

Wiring First—We maintain wiring engineers whose sole duties are to work closely with the architects, contractors and owners. Our theory is wiring comes first. Without adequate wiring there is no possibility of securing good lighting. On new jobs emphasis is placed upon securing a good wiring job, for with adequate wiring selling of good lighting jobs is made much easier. We intend to increase our activities in 1939 and work closely along the lines outlined by the National Adequate Wiring Bureau.—SOUTH CAROLINA POWER CO.

Sales Training—We have promoted adequate wiring in newspapers using a series of advertisements together with radio spot announcements, based upon material furnished by the Adequate Wiring Bureau. Sales training in adequate wiring has been provided for all sales employees and adequate wiring has been promoted with architects, builders and home owners; planning service and assistance in making proper wiring layouts has been given on all building projects. Our plans for 1939 involve the continuation of this program and we feel our program of sales training calling attention to the benefits derived from adequate wiring will enable dealers, builders and wire men to sell home owners and builders on the advantage of providing more adequate wiring in homes under construction.—KANSAS GAS & ELECTRIC CO.

Mailings, Meetings—Adequate Wiring Committee is made up of representatives from the various divisions of the Indianapolis Electric League, such as distributors, contractors, dealers, utilities, etc. This committee has devoted itself strictly to an educational program. The initial step was a general meeting for local distributors, contractors, city inspectors and others. The plan was announced whereby a series of direct mail pieces would be sent by the league office to reach prospect names turned in by member contractors. Furthermore, we are using adequate wiring copy on the back of utility company bills.—INDIANAPOLIS POWER & LIGHT CO.

Skeleton Exhibits—A definite promotional plan will be instituted in 1939. We have already made arrangements to include the skeleton house-wiring exhibit used at the Philadelphia Electric Show in 1938 at the Lehigh Valley Electrical Exposition early in March and will establish a quota of adequately rewired homes for each of our divisions as a 1939 objective.—PENNSYLVANIA POWER & LIGHT CO.

Floor Plans—As result of our meetings held by the wiring contractors last year, we believe that the wiring contractors have been impressed with the existence of the Adequate Wiring Bureau and have at last become conscious of the fact that wiring must now be merchandised. Some of our contractors are now taking floor plans of contemplated residences to the owners.

We have an alert functioning construction league which maintains a showroom where all kinds of building materials and equipment may be seen. The master electricians maintain an adequate wiring display. It is our intention to work with the Construction League in 1939 and if possible to expand the facilities already instituted. We will continue our advertising program of last year in sponsoring adequate wiring through the newspapers.—PUBLIC SERVICE CO. OF OKLAHOMA.

Sound Films—We have sponsored the adequate wiring program through our participation in the Fox Valley Electric League; $800 was appropriated by the league for newspaper advertising, monthly league meetings, talks, movies and demonstrations on adequate wiring. Our lighting and power engineers incorporate adequacy of wiring in all of their recommendations. Our home service department covers this matter on residential lighting calls.

The Electric League is considering purchasing a sound film entitled "Getting the Most out of Electricity Safely," to be shown to civic clubs, schools, P.T.A. groups, etc. A convenience outlet campaign is under consideration and promotions of 1938 will be continued.—WESTERN UNITED GAS & ELECTRIC CO.

CASE STUDIES of ADEQUATE WIRING PROGRESS by Utility Companies

Birmingham Certifies Six New Residences

By ROY H. KNOX
Supervisor Sales Promotion and Advertising Department, Birmingham Electric Company, Birmingham, Ala.

Since its inauguration last May the certified plan of wiring has found its way into six new homes due to our promotion efforts. Although failing to secure certification in many homes, we have at least raised the standard of wiring appreciably. This is reflected in approximately 25 per cent increase in number of convenience outlets and increases in the number of circuits.

Since the success of commercial load-building activities hinges upon adequate wiring, our department during 1938 worked with customers, architects, contractors, engineers, city inspectors and the local electrical associations in selling the need for adequate wiring. Special group meetings with the architects were held to insure continued friendly relations and understanding of the importance of adequate wiring. Our engineers have assisted in making layouts for architects, contractors and customers.

Two direct mailings of adequate wiring literature were mailed to all of our industrial customers during 1938 with an offer of the company to assist in making wiring layouts for the customers.

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92% Successful in 900 Homes

By MISS JUANITA WALTER
Home Planning Department, Tennessee Electric Power Company

Out of 1,251 residences completed in the territory in twelve months, Tennessee Electric Power furnished wiring specifications for 901. The company recommended 42,837 outlets of all kinds and 92.5 per cent or 39,665 outlets were installed. The average is 44 outlets per house.

Number 12 wire was recommended in 790 cases and 51 per cent or 403 of the homes installed No. 12 wire.

In 153 remodeled homes 61 wiring specifications have been drawn with 1,512 outlets added. In these same homes 65 new major appliances have been added and four old ones replaced, while the added lighting load totals 68.9 kw.

The 1939 plan will be developed along three new avenues. A well-advertised certification plan will be launched to meet a predicted building boom. All-electric home shows will be staged at strategic points in Tennessee and, thirdly, the rural extension department plans a more intensive educational program and closer checks on "home planners."

•

Sixty per Cent Red Seal in Kansas City

Approximately 60 per cent of the new homes built on our system are now meeting the Red Seal specifications. The residences that do not actually follow the specifications are much better, we are pleased to say, than had we not been actually promoting the Red Seal work.

The only adequate wiring program we have followed has been our Red Seal wiring program, which has now been in use more than twelve years with very satisfactory results. As a matter of fact our results with the Red Seal plan have been so satisfactory during this period of time that we do not feel the time has yet come for us to drop our Red Seal certificate plan and change over to the National Adequate Wiring Program.

Our plan for 1939 will mean a continuation of the Red Seal work, with possibly a new and somewhat higher specification, which we shall probably designate as the de luxe specification form. Plans also are being made for a commercial adequate wiring program and at this time this is in the discussion stage.

We are convinced that if we expect to keep on increasing kilowatt-hour sales it is going to be necessary to do something about wiring systems in a large number of the buildings connected to our system and which have been built more than ten years. It is in these buildings that we must look for a large percentage of our commercial sales growth in future.

•

Utah Concentrates on Low-Priced Homes

Our organization has been functioning only since last May and in the brief time we have been promoting adequate wiring in the Salt Lake City area we have discovered a tremendous need for such activity.

On July 5, 1938, we received a license from the National Bureau to operate the certified adequate wiring plan in this vicinity. We now have approximately twenty homes that have qualified for this certificate and the National Bureau has requested that we forward copies of our certified wiring specification booklet to be used as models in cities contemplating the inauguration of this plan.

There is much to be done in the way of promotion and educational work, particularly with people who build cottages in the lower price brackets. The majority of homes will be in this classification and the majority of our work will have to be with this class of people, who would like to have adequate wiring but feel now that they cannot afford it.

•

West Penn Attains 696 Certifications

By H. S. METCALFE
Director of Public Relations West Penn Power Company, Pittsburgh, Pa.

The results of the company's domestic adequate wiring promotion for the last two years with installations certified were 444 in 1937 and 696 in 1938, an increase of 56.8 per cent. The number of installations not qualifying for certification, but in which the

wiring was improved, while not known, are believed to be considerable.

In the commercial field 4,993 personal contacts have been made with customers to discuss adequate wiring and 291 written recommendations and specifications involving 10,520 kw. of wiring capacity have been submitted. These activities have resulted in the sale of 4,127 kw. of excess wiring capacity over and above the present requirement of the customers.

In the industrial field 37 written recommendations and specifications involving 1,730 kw. of wiring capacity have been submitted to customers and no records are available at the moment as to just how many of these jobs have been sold.

Complete details of our enlarged and broadened plan are embodied in our Plan Book published in December, 1938. The plan is based largely on enlisting the co-operation of contractors, architects and builders. Additional material has been made available since the Plan Book was published. We expect to continue our present activity along all three lines of residential, commercial and industrial installations.

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Monongahela Figures on E.A.R. of $33,468

By J. R. WATERS, JR.
Residential Promotion Manager
Monongahela West Penn
Public Service Company, Fairmont, W. Va.

Speaking for residential results only, during 1938 we have sold 10,824 additional double convenience outlets. This is an average increase of eight outlets per layout over and above the customer's original intention. We estimate 837 kw. of new lighting load has resulted from wiring layouts made for home builders and home modernizers. From these figures, giving each double outlet a value of 75 watts, and appraising each kilowatt connected at $20, we estimate an E.A.R. of $33,468.

This work was done by eight domestic lighting representatives, who in addition were responsible for the supervision of fifteen I.E.S. lamp salesmen and for laying out some 40 electric kitchen plans. Similar and equally effective commercial results were obtained by our six commercial lighting specialists.

We are planning on a vigorous program for 1939 embraing publicity, advertising, co-operative work and a selling program.

As a part of our co-operative program we shall hold contractor-dealer meetings to stimulate group interest to develop co-operative advertising through newspapers and direct mail, develop sales programs and sales training, to arrange for exhibits of adequate wiring displays in five major towns, and to arrange for a special adequate wiring card on new construction showing how adequacy is provided in wiring installations. Furthermore, we shall provide window display material for co-operating dealers.

On our 1939 selling program eight domestic lighting representatives will make layouts for new homes and home modernization and special rural wiring plans. A convenience outlet sales campaign in connection with the I.E.S. lamp sales and the electric roaster sales will be conducted. We shall include the cost of the outlets in the sales contracts through co-operation of contractors. Furthermore, we shall couple additional wiring selling efforts with electric range installation programs.

•

Pacific Power Gains 1,597 Double Outlets

By D. B. LEONARD
Commercial Manager, Pacific Power & Light Company, Yakima, Wash.

In the spring of 1938 we used newspaper advertising and yellow bill stuffers sent by direct mail to promote the adequate wiring campaign. As a result of this activity a survey made of 57 dealers who participated in the campaign resulted in a total installation figure of 1,597 double convenience outlets.

We have always recognized that adequate utility service based on good voltage, ample capacity and low rates does not in itself mean increased use of service. The sale of appliances does not always mean good service unless the electrical energy which is delivered at the customer's meter is conveyed though adequate wiring to the appliance.

Further to stimulate the number of convenience outlets used on the consumer's premises and to promote adequate wiring we have developed a series of advertisements to be published this year. We feel that this program will be helpful in creating the necessity for adequate wiring capacity in the minds of the customers who will be reached with this campaign.

•

Minnesota Promotes State Certification

In April and May of last year the North Central Associated Electrical Industries held fourteen meetings with contractors in various parts of the state, to outline the plan of the National Adequate Wiring Program and promote enthusiasm in this program. A direct-mail campaign based upon nine pieces of national advertising material was developed and a ten-week radio program on the subject was sponsored by the Duluth Contractors Association.

A major project for 1939 will be the establishment of a State Certification Plan, under which the contractor and a utility representative will examine jointly the wiring installations. The utility representative will sign a proof of adequate wiring which will be forwarded to the association office. A certificate of adequate wiring will be mailed to the owner and a small outdoor sign on each adequately wired home will call the attention of the public to the fact that it is adequately wired.

This modification of the standard certification plan has been under discussion for some time and will be presented to our state contractors at their convention next week. In carrying out this plan we have had the co-operation of two large wire manufacturing companies.

•

Outlets Double; Switches Up 30%

By W. H. McINNES
General Sales Manager Memphis Power & Light Company, Memphis, Tenn.

Although in the actual number of certified installations we have perhaps not done an outstanding job, we do feel that practically all installations in new homes have been materially increased due to the publicity on adequate wiring. Homes which are now being built have approximately 30 per cent more lighting and switch outlets and practically double the number of convenience outlets that were usually installed in new homes as recently as three years ago.

During the past year 93 homes were awarded certificates and seals of adequacy. This activity was sponsored by the Memphis Electric League, of which our company and several employees were members.

All promotion was conducted in the name of this league. We have continually

***DALLAS DEMONSTRATES DROPS**—An illuminated wattmeter on an ingenious display board is used to prove to customers how much they lose by attempting to serve appliances illustrated through 125-ft. lengths of Nos. 14, 12 and 10 wire, respectively*

ANIMATION BY WEST PENN—Flashers are used on this board developed by West Penn Power Company to impress the observer by successive illumination of diagrams and panels with the convenience, safety and economy of adequate wiring

stressed the importance of adequate wiring for commercial and industrial customers, although we have no record of detailed results. Several buildings in Memphis have improved their wiring as a part of remodeling jobs and one large office building of fifteen stories has been rewired to increase its capacity.

•

Arkansas Quota 1,000 Jobs in 1939

By P. C. TUCKER

General Sales Manager Arkansas Power & Light Company, Pine Bluff, Ark.

We have been very active in adequate wiring, especially so in the use of CNX cable, and now have wired on our various rural lines approximately 2,000 residential commercial and public buildings.

We have found that by using covered neutral cable we can sell more outlets per establishment and have been very fortunate in getting the acceptance of this type of cable by some 25 or 30 contractors.

For 1939 we have set up a quota of 1,000 establishments to be wired. We try to make at least two mailings per month of material to our dealers and we expect to continue this practice during the year 1939. We also send out a dealer publication entitled "Geared Sales," as this is one of the means that we employ to tell the story of adequate wiring to our dealer friends. In 1939 we shall be actively promoting the sale of adequate simplified wiring because it is impossible to sell portable current-consuming devices, lamps and other items to our customers unless they have convenient outlets in which to use the appliance which they purchase.

•

102 Newspapers Used by Kentucky Group

Co-ordination of industry effort was attempted through the organization of an outside agency composed of all branches of the electrical industry in Kentucky and this organization was incorporated as "The Electric Institute of Kentucky."

Educational meetings were held in various sections of the state to encourage electrical contractors to participate in the program. In Lexington two adequate wired homes were certified and used for public display. To further the educational work, advertisements were placed in 102 newspapers in the state and during the past twelve months a foundation has been laid for more intensive promotion during 1939.

Promotional work in 1939 will be directed primarily toward the residential customer. Advertising will feature the large loss sustained by the customers where inadequate wiring exists. Advertisements will appear in the 102 newspaprs mentioned above. Spots in the classified section will feature the advantages of adequate wiring. Our bills will carry adequate wiring advertising. Each of our 52 offices will have pamphlets for distribution and the certification plan will be used in Lexington and possibly in Paducah.

Educational programs will be conducted for dealers and contractors and employees and co-ordination of effort of all the other branches of the industry will be sought through "The Electric Institute of Kentucky."

•

Milwaukee Promotes Three Standards

By I. L. ILLING

Illuminating Engineer Wisconsin Electric Power Company, Milwaukee, Wis.

Now in its second printing, we feel that our handbook "Standards of Adequate Wiring for Residences" possesses a number of advantages worth consideration. This booklet outlines three grades of wiring. "Grade B" (shown in green in the booklet) represents the minimum requirements for reasonably adequate wiring. "Grade A" shows added requirements for more comfort and convenience. "Grade AA" depicts other added items for fuller utilization of electric service.

We find that the use of three "standards" enables the salesman to build up a sale. We can point out possibilities otherwise not considered by the owner and let the customer feel he is making his own decision. He feels greater confidence in us and more readily accepts such recommendations of larger service entrance, more circuits, etc.

In 1939 we plan to amplify our newspaper advertising campaign, continue our radio broadcasting, repeat our display in the Milwaukee Home Show, continue our educational work with contractors and design an illuminated house number with the Adequate Wiring emblem.

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Cincinnati Builders Co-operate

By J. R. HARTMAN

Manager, Electric Sales Department, Cincinnati Gas & Electric Company

For many years our residential wiring department has specified wiring in accordance with the Red Seal program. We find that the new adequate wiring specifications for residences increased the number of light and convenience outlets and switches approximately 38 per cent. The builders have accepted these recommendations in practically all instances since it was adopted here in Cincinnati August 1, 1938.

We have specified adequate wiring for 115 new residences which will be built this spring. Twelve houses have been completed and have received adequate wiring certificates. One builder who is opening a new subdivision has received six of these certificates for the first six houses completed. All of the houses in this subdivision will be so wired.

The Adequate Wiring Handbook for Commercial and Industrial Wiring was delivered to all architects and to numerous electrical contractors in this territory. The benefits of adequate wiring were discussed with them at that time and we have found that since then they have shown a marked improvement in wiring specifications.

We are planning to continue a series of daily ads consisting of cartoons showing pet peeves. These will illustrate light at home before and after adequate wiring. The "before" is the usual type of wiring and the "after" picture shows the conveniences that result from adequate wiring. All of the lighting and wiring layouts that we make during the year 1939 are to be in accordance with adequate wiring specifications.

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Richmond Uses Over 1,000 Column-Inches

By A. H. HERRMANN

Virginia Electric & Power Company, Richmond, Va.

Considerable publicity has been developed throughout the past year in the news as well as in the advertising columns of the local newspapers, which in the aggregate amounted to 106 inches, or five full columns, of news and paid display advertising aggregating 1,045 inches. Of this display advertising, 577 inches were published over the signature of the Electrical League of Richmond and the balance over the signature of this company, all advertising being di-

rected toward more adequate wiring in the home.

Last November the league was authorized to use the Adequate Wiring Bureau certification plan. So far one house has been certified and others are awaiting application and approval.

Since the league has taken on the adequate wiring program as a major activity, it has been found desirable to devote a considerable part of the meetings during the year to promoting the plan among its own members as well as among local architects and builders.

While the results so far cannot be shown in terms of added loads, usage and revenue, nevertheless we feel that the plan of adequate wiring is basic to the progress of the electric industry and will produce worthwhile results over long-range programs. Accordingly, it is planned to continue the work started during 1939 and concentrate activities during this new year in an endeavor to obtain widespread acceptance of adequate wiring in the residences of the Richmond area.

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Duke Uses Radio, Mailings, Exposition

By N. E. TINDAL

Duke Power Company, Charlotte, N. C.

During the past twelve months considerable progress has been experienced in the promotion of adequate wiring in Charlotte. This activity has been confined rather closely to the residential field because it was believed that this field was in greater need of such a program than either the industrial or commercial.

The local Adequate Wiring Bureau, composed of members representing electrical jobbers, electrical contractors and utilities, has been organized. The bureau jointly financed by these groups has done considerable promotion work and has accomplished unexpected results.

In eight months this bureau has run 1,359 inches of paid advertising and has had several radio broadcasts on adequate wiring. Besides supplying information for numerous news items, it has mailed 2,049 letters to prospective home builders, displayed window posters in all electrical shops, employed college men to conduct a house-to-house campaign for improved wiring, held a display on adequate wiring before approximately 2,000 people at the lighting show in Charlotte and has issued four certificates to adequately wired homes. Moreover, its work on numerous wiring plans has resulted in a marked increase in the number of installed outlets.

Plans are now being formulated for a more extensive campaign on adequate wiring during 1939, and stress will be laid on the values of certified wiring so that we may get a marked increase in the percentage of homes certified.

•

Spokane Provides Simplified "Specs"

By H. C. BENDER

General Sales Department, Washington Power Company, Spokane, Wash.

We formed a local adequate wiring bureau and our first task was to prepare a simplified specification sheet that most of the builders are now using in their general specifications. We have shown the financial loan institutions how to check the quality of a wiring job. The Better Housing Bureau is using the form in all building specifications it prepares.

A "Half-and-Half House" was sponsored in which adequate wiring was featured. A house about twenty years old was partly remodeled. It was divided along a center line, the old overhanging eaves replaced by a new box cornice and the entire improved half was painted. Inside a similar procedure was followed. Half the beamed ceilings were removed, half the old fireplace shelves, etc., and this half was remodeled, painted and papered.

During 1939 we plan to continue to encourage the use of specification sheets, to use the certification plan of the National Adequate Wiring Bureau, support the local Adequate Wiring Bureau, to use model homes in promoting the movement and to initiate an advertising program to assist in this activity.

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Poughkeepsie Adds 7,500 Kitchen Outlets

By H. E. DEXTER

General Commercial Manager Central Hudson Gas & Electric Corporation, Poughkeepsie, N. Y.

The only practical way of selling wiring to the customer is to sell it after new loads have been added. In this our company has been extremely active. During the past year there have been approximately 7,500 outlets added in the kitchens of the homes of our customers and the kitchen outlet produces by far the greater revenue for the utility.

In commercial work our company has been quite active. Several of the schools have been rewired on account of higher intensity of lighting which we sold the school. Poughkeepsie High School has been rewired as a result of a new lighting job and the lighting on two schools alone has cost approximately $10,000. We have quite a list of other jobs which have been done.

It seems to me that the biggest possibility for the adequate wiring program is new construction. We have been active in this field not only in new buildings but throughout our entire rural territory, where many farms and rural dwellings have been wired or are being wired for the first time. Here we give every customer an adequate wiring layout specifying capacities and feeders. We believe in a vigorous attack on new homes because it is the new that sets the pace for the old.

CERTIFICATE OF ELECTRICAL CONVENIENCE

This Is To Certify that a well-planned wiring system, which provides electrical facilities for home comfort and attractiveness, has been installed in the building located at

ADEQUATE WIRING SERVES AND SAVES

The number of outlets, switches and other essentials for artistic lighting and for the ready use of electrical conveniences has been checked by an authorized representative of the undersigned organization.

This certificate is evidence that the electrical contractor has completed a wiring installation conforming to a standard of adequacy approved by National authorities and known as

Blue Seal–Superior

CONSOLIDATED GAS ELECTRIC LIGHT AND POWER COMPANY OF BALTIMORE

by

Certificate No. Date

BALTIMORE CERTIFIES 120 HOMES—An additional 315 houses are known to have increased their installations and at least 250 more are believed to have installed more outlets due to company's efforts

Commercial Wiring Promotion in Boston

By JOHN J. CADDIGAN
Assistant Sales Manager
Boston Edison Company,
Boston, Mass.

FROM every viewpoint the development of adequate wiring is beneficial to the general public, the user of electric service, the utility company and the other branches of the industry. There are no "outs" about it, and yet the movement gains headway too slowly in many areas.

In Boston we are blessed with a highly diversified commercial load which includes many department stores, small retail establishments, wholesale houses, hotels, clubs, garages, institutions, public and office buildings, in addition to homes and factories. In building our load we are under obligation to promote applications of electricity which will first of all benefit the user, and this calls for safe wiring, wiring of sufficient capacity to insure first-class voltage regulation at every outlet under both present and foreseeable load conditions, and enough flexibility of circuit protective and switching layout to enable the user to operate economically. We greatly prefer to sell electricity as it is used in customer equipment to energy lost in wiring of inferior capacity, because the satisfaction of the customer is fundamental to our lasting success. Low-capacity wiring is a bottleneck in the use and expansion of electric service which should not be allowed to exist.

Commercial advantages

Adequate wiring not only means safety, security and better living, but in the commercial field it means better lighting for a given energy consumption; getting the most out of lamps, motors and heating devices; opportunity for far more effective displays of merchandise; increased drawing power over customers, and much more wholesome conditions under which employees work. It means putting a four-lane raceway for electrical energy traffic into places where narrow passages, so to speak, throttle down usage. Reduced fire hazard is important, and it is a pleasure to note that the Fire Prevention Patrol of the Boston Fire Department has just begun a city-wide survey of wiring conditions by way of a reinspection of commercial and industrial buildings which was unquestionably stimulated by the promotional meetings and other activities of the local electrical industry here during 1938.

We had three meetings in Boston last year on behalf of adequate wiring. These were well attended, the setting being our general service buildings, and all branches of the industry were represented. Unfortunately the hurricane of September 21 struck Boston just as we were getting under way toward definite progress, and for weeks there was no time to think of this particular development. However, a very definite movement is now under way, especially in Boston office buildings, for the modernization of lighting and related wiring. Building managers have begun to realize that they cannot hold or attract tenants unless these facilities are first class. In a city as old as Boston there are of course many installations which are sadly out of date from the wiring standpoint, and gradually we are seeing building owners, architects and electrical contractors swinging into line on behalf of wiring of 1939 standards and availability.

Our lighting engineers do considerable survey work, and primarily recommend the installation of high-capacity wiring, with relatively less emphasis on the desirable size of lighting units and foot-candle intensities. These of course are recommended to suit conditions, bearing in mind the strong upward trend in intensities compared with practice of even a very few years ago, but we believe that unless the copper goes into a building in the first place, along with flexible circuit layouts, fusing or circuit breaker facilities in line with the most modern ideas, the customer's service is likely to be below par in due course, if not early, and this without regard to our distribution facilities reaching his premises. We do not make wiring layouts for general commercial applications, considering this the electrical contractor's sphere, but we co-operate in reommending adequate wiring at every opportunity.

We encourage the rewiring of old buildings, and believe that much can be done in this line and at lower relative cost than formerly by utilizing the most modern wiring devices. The new thinner wall insulation permits the contractor to pull in larger sizes of conductor without costly structural changes in the building. A building with inadequate wiring is like having a man only 60 per cent healthy on a job requiring a 100 per cent physique. It is safe to say that never before did the electrical industry have within reach such high-grade and diversified wiring supplies as today, nor such an opportunity to develop this market. We know well that an enormous amount of wiring is today obsolete as to capacity for the necessary service; insufficient in layout and allied material to give the customer the facilities progress has brought forth.

Share responsibility

This year we hope to see and share in a growing and definite co-operation by all branches of the industry in pushing this movement. It will be helpful if national manufacturers come into the picture more effectively in local and regional campaigns. Without discounting the value of promotional advertising of wiring in general media and other nation-wide publications, I believe this should be supplemented by co-operative advertising in our own neighborhoods.

The movement is too large and too important to be allowed to drag for lack of support by all branches. No single branch should be expected to bear the brunt of promotional costs.

Our own promotional work, especially in industrial lighting and power sales, home

service development, and in commercial and domestic electric cooking layouts and sales, is an unceasing stimulus toward adequate wiring. This will be continued vigorously in 1939. Architects are becoming more "wiring conscious," and some electrical contractors have stepped considerably beyond the rank and file in their promotional work. The all-electric kitchens which we promote and lay out are doing their part to acquaint the public with what modern wiring facilities mean. We anticipate that the pace of this movement will accelerate in our territory as the various branches of the industry realize the necessity for all putting their shoulders to the wheel. Our Boston Metropolitan Electrical League is keenly interested in adequate wiring and sponsored the 1938 meetings with enthusiasm. We look forward to better things this year in this vital field.

How Rochester Sells Industrial Wiring

By IVAR LUNDGAARD

Manager Industrial Department,
Rochester Gas & Electric Corporation,
Rochester, N. Y.

AT THE outset there are two points to be cleared up with respect to our program of adequate wiring in the industrial field.

First of all, it is a long-established policy of our company to co-operate in every way and to the fullest extent with the people who use our service. Our efforts to co-operate with industrial customers to help them secure adequate wiring is therefore simply one of the many which we practice as a part of our broad company policy.

Secondly, just as this co-operative policy is not a recent innovation of our company, so also our work in adequate wiring for industrial customers did not start yesterday. We have been busy at this particular task for a decade.

Out of this experience we have learned many things about what to do as well as mistakes to avoid. We feel now that our present results are simply the fruit of this rather extensive experience.

Today we are working under a co-operative arrangement with the customers, the architects and the contractors whereby the established industrial customers are rewiring their plants and the new customers get started off on the right foot with adequate wiring installations.

We are frequently asked what it is that sells the industrial customer on the fact that he must face the fact that he needs to improve and enlarge upon his present wiring installation. We find there are three causes that bring this about: First, the need for better wiring may be emphasized by troubles in the plant. The customer tells us of fuses which blow too frequently, of overheating of switches and wires, of lighting that has become dim and of losses in production sustained thereby.

Frequently our power salesmen show the customer the most obvious needs of his own plant by tactfully pointing out obsolete methods and installations that constitute a threat to continued satisfactory plant production. Thirdly, and less frequently, upon making our customary thorough investigation of a high bill complaint, we find that savings—which we calculate—will result from the installation of up-to-date wiring. Of course over the years we have built up a certain reputation among our customers so that as they talk among themselves they know of our interest in their problems and of the steps which we can and do take to help them, which under some conditions involves helping them with their wiring problems.

In these ways our hundreds of modernized wiring jobs have started. We have felt this approach to be much more practical and much more successful than to engage in helter-skelter, noisy promotion because we have avoided stirring up customers regarding their wiring installation when perhaps it was up to all ordinary standards. The latter is too much like pulling a fire alarm, getting all the fire engines out, calling out the police, blocking traffic and upsetting everybody, when what we saw was after

***AKRON'S MAYOR PRESENTS**—The first adequate wiring certificate in Akron, Ohio, is presented to the owners of the home by his Honor, Lee D. Schroy, Mayor of Akron. An all-industry dinner, attended by 100, followed the event*

all not a fire but perhaps merely a wisp of steam.

In cases of new construction, such as a new industry or extensions to present plants, the architect or the contractor or both understand the advisability of an adequate wiring job and so open up still other opportunities for us to co-operate with them and with our customers.

So, it will be seen that by following this procedure the customer is much more interested in his wiring problem, more receptive to our suggestions and more appreciative of our help.

Just what direction does our co-operation take? Just what is its scope?

Well, after these specific needs have been recognized in an individual situation and our co-operation is sought we go into the plant and make a complete inventory of the electrical equipment installed. This inventory starts at the meters and includes all panels, load centers, switches, breakers, fuses, feeders and branches, together with all current-consuming devices in use such as motors, lamps, welding equipment, heating, etc.

We then confer with the customer regarding possible load growth, lighting as well as power, possible rearrangement of machines or departments, new equipment which may be installed in future, and with all this information at hand we are ready to prepare a drawing for the specific industrial customer.

All of this preparatory work—the preparation of the drawings and specifications, the inspections of the finished job—all of our work along these lines is done without charge to the customer. It is done without charge for architects, engineers, contractors or any other parties involved because of the standing company policy stated at the beginning of this story.

Drawings vs. specs

We favor drawings over the customary specifications for a number of reasons. We find, for example, that the customer gains a much better idea of the scope of the work to be done if it is visualized for him on a drawing. He is a novelty manufacturer, or a maker of dental products, or runs an automobile plant and is more familiar with his own business than he is with the electrical business. To the average well-informed industrial executive specs are seldom more than a conglomeration of figures which he does not understand and therefore may easily mistrust.

In fact, we find that complete correct drawings help us as well as the man who is paying for the installation; they help the architects, the engineers and contractors.

On these drawings we lay out to scale our recommendations for an adequate wiring job and indicate what each part of the layout is. Our recommendations are based upon the 1937 Code as a minimum and our suggestions embrace a proportionate increase above Code requirements to insure good service.

These drawings sometimes require one man's time for two weeks, and upon completion they are submitted to the customer with our compliments. The customer may then accept our recommendations and let the contracts, or he may wish to have them modified, or he is perfectly free to reject them entirely if he wishes.

We are pleased, however, that hundreds of these plans have been accepted, adopted and installed. They have resulted in an ever-increasing number of satisfactory installations in both the new plants coming into our territory (a recent example being the new General Motors plant) as well as in the older plants where totally unsuitable wiring installations were a source of trouble to the customer and to ourselves.

The industrial customers have expressed themselves as very well pleased with the results particularly as industrial shutdowns have been eliminated. As utility men we realize the need for maintaining constant service to our customers. Sometimes we may not fully realize the importance of an industrial customer's shutdown and with the great expense which results in losses, waste and spoilage. Uninterrupted production may mean the difference between success and failure of an industrial customer.

Over the past ten years we feel that our efforts to co-operate in the installation of adequate wiring for industrial customers have been quite satisfactory and well worth while.

We are now at the point where a customer, or his architect or his contractor or his engineer, bring their wiring problems to us first. They too have learned from experience that a skimpy wiring job is never satisfactory. On the other hand they realize there is not much gained by putting in two or three times as much copper as is needed "just to be on the safe side." These people know that our primary interest is to be of constructive assistance in the proper use of our service, without waste and without undue expense, and that our plans work out as they should and still do not entail too great an initial investment. Plant electricians and plant engineers are most helpful to us as the results are a reduction in their difficulties and a more satisfied management.

Step by Step at Rochester

1. *Company enters picture after customer contacts company, on suggestion of power salesman, or upon service trouble call.*
2. *Complete survey made of present equipment, and conference held on future growth prospects.*
3. *Complete drawings showing old installation and proposed adequate installation prepared for and presented to customer.*

You wouldn't go back to this...
Yet old-fashioned wiring in your house is just as inefficient as the old-fashioned automobile
STOP WASTE! SAVE ELECTRICITY
When you build, buy or lease a house, be sure it is Adequately Wired so that you can be certain of satisfactory electric service
ADEQUATE WIRING ADVANTAGES—
1. It prevents most service failures
2. It stops waste of electricity
3. It assures satisfactory operation of electric appliances
4. It makes your home really modern
5. It increases the value of your property
6. It eliminates future costly additions or changes
ADEQUATE WIRING enables you to use your labor-saving appliances when and where desired. It assures better operation and gives you all the electric current you pay for. It saves you the annoyance of fuse failures. It makes your home truly modern.
Adequate Wiring simply means the use of wires big enough to satisfactorily supply your lights and appliances—plus a sufficient number of convenience outlets in each room—plus the necessary number of switches for proper control of current all over the house.
Adequate Wiring costs only a few dollars more. But it saves many dollars in the long run and increases the value of your property materially.
Any Reliable Electrical Contractor Will Be Glad To Explain Details
ELECTRIC INSTITUTE OF KENTUCKY
Incorporated

MORE THAN 100 NEWSPAPERS—Electric Institute of Kentucky runs ads of this type in 102 newspapers, displays adequately wired homes, advertises adequate wiring on bills and "sells" idea to dealers and contractors

TVA Settlement Politics

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

BACK of the TVA settlement with the Tennessee Electric Power Company is something of tremendously greater importance that the 15 or 20 million dollars above the Lilienthal concept which the security holders will receive. It is something which is of vital interest to business in general and to the electric industry in particular.

It means that President Roosevelt has finally been sold on the idea that the government's obvious hostility to the electric industry has been the most important of the easily removable barriers which have been stopping the return of prosperity.

The history of the sale of this bill of goods is of importance not merely because of its interest but because it foreshadows a course of action which can be depended on for two years.

We start off with the report, a little more than a year ago, that the electric industry had a backlog of spending of billions of dollars. The President's first reaction to this was of increased anger against the utilities. He visualized the wicked power barons conspiring to ruin the New Deal—to get another reactionary administration in Washington. He called in some utility heads and tried to convince them the Administration was not threatening them. It took some doing to convince the President, finally, that it was the fear of investors as to what might happen which was the logjam, not the political preferences of the men who happened to be important in utility circles.

TVA investigation

Then came the TVA blowup, with the charges of Arthur E. Morgan, the decision of Congress to investigate and the stupid and uninteresting whitewashing job by the committee.

Far more important came the "purge" primaries, leaving the Southern conservatives in the saddle in so many states that New Deal domination of the next Democratic convention was jeopardized.

Then came the election, demonstrating that even where the New Deal plus the CIO might have won primaries against the conservative Democrats, as notably in Ohio and Oregon, there was no balm in Gilead, for the Republicans won the elections. True, the Democrats elected a substantial majority of the House, but the threat both from conservative and Republican quarters became menacing.

And, finally, business continues speckled, the federal debt goes on mounting, more taxes become imperative and the agricultural policy apparently was not a good vote winner.

So the problem became, about the time that Harry Hopkins was nominated for Secretary of Commerce, what to do to make sure that the New Deal goes marching on after 1940. There was the obvious danger that the conservative Democrats might capture the convention, and name a new President who would kick the Corcorans, the Cohens, the Ickes' and the Perkins' out of Washington. (Hugh Johnson about this time scared the New Deal gosh darnedly by a line in a magazine story saying that if Garner became President "there would be the greatest exodus of crackpots from Washington since the Pied Piper led the rats out of Hamlin.")

There was the danger that even if the conservative Democrats should be defeated at the Democratic convention the country might elect a Republican.

What to do?

Hopkins and Chairman Douglas of SEC sold the President on the solution. Business must be encouraged. The simple way to start prosperity on the road back was to break the utility logjam—release that four billions of piled up spending by showing the investors of the country they could put their money safely into the electric industry.

If there is prosperity, starting say six months hence and sweeping on to flood as the conventions meet in June, 1940, and through to the November election, Roosevelt and the particular group of advisers dominating the present trend believe the New Deal will be continued for four more years. "Gains" will be consolidated, not scrapped. Roosevelt will go down in history as the man who started constructive reforms, will not risk the judgment of historians of having started a lot of crackpot ideas which failed to work.

That is why the Tennessee Electric Company got nearly twenty million dollars more for its properties than David E. Lilienthal had been willing to give. That is why there will not be any great White House pressure for more TVAs to scare the life out of other utilities. That is why PWA loans and grants for new public ownership systems will be few and far between.

There is another little element which will contribute to consummation of those additional points which Wendell L. Willkie said would be necessary to encourage spending by the utilities. For instance, no further dam building in new quarters. Most people have forgotten it, but the best speech ever made against government hydro-electric projects was made, back in 1934, by John L. Lewis, speaking not as a would-be political force, but as the head of the United Mine Workers.

Coal Association protests

ELECTRICAL WORLD reprinted that speech, in 1936, but the coal miners were following Lewis politically then. Now the National Coal Association is talking—it would be better if the arguments came from the coal miners, but the owners are talking language which fits in with the present

[*Continued on page 128*]

Editorials

S. B. WILLIAMS, Editor

How to Make This Tax Story Click?

THE MAN in the street is not very sympathetic toward the tax problem of anybody else. He pays taxes, he will tell you, plenty of them, why shouldn't other people? But he must be impressed with the tax problems of those who serve him if he intends to maintain his standard of living. For, in the final analysis, whatever they pay, he in turn pays.

The fact that the customer pays 15 or 16 or 17 per cent of his bill for taxes hasn't impressed him very much. He frequently pays twice that percentage in his gasoline bill. If the figure seems small to him, perhaps there are other more impressive ways to say the same thing.

Last year the total operating expenses of privately owned electric utilities was 772 millions. Taxes were 338 millions. Thus, for every dollar the customer paid for utilities to buy coal, pay wages and meet other operating expenses, he paid an additional 43 cents—to the utility as a tax collector. This is 10 cents more than it was five years previously.

It has been suggested that every electric bill carry on it two figures—the price for the service and the additional amount collected in taxes.

Both ideas have one thing in common, that of showing the customer how cheap electricity of itself is and how costly are the taxes. He does not care how much the utility pays, but he is interested in how much the utility collects from him, whether it be for electric service or for taxes.

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They Also Sell Well Who Serve Well

"THE coat and pants do all the work, but the vest gets all the gravy." This little refrain ran through our minds as we thought of the relation of the sales department to all the rest of the company.

The load builders, like any other sales organization, get the credit for increasing the business of the company, but back of them are the thousands of men and women who make the product, distribute it, service it, bill it and otherwise affect the use of electricity. If there are repeated outages, for instance, it might be impossible to sell electric ranges. If cashiers are cold or unpleasant, customers may not care to linger in the showroom. There are any number of ways in which these other employees can affect the desire of the customer to use more or less service that it should be obvious that load building is not solely a function of sales.

One utility has recognized this situation in its 1939 sales plan. It is selling the company to the customers and in that way is building up an employee morale and responsibility. In this way teamwork between the sales department and the rest of the company is expected to result.

These are days of intensive sales effort. They are also days when costs must be watched. Co-ordination between the sales department and the rest of the company can reduce costs by making sales easier.

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Fluorescent Lighting An Opportunity

EACH new electrical development finds opposition to its adoption and use. A case in point is the new fluorescent lighting. Here and there come the reports that are as old as history—it will reduce revenue, it will create bad power factor conditions. Instances are available where sales have been stopped because of these reports.

Such action comes about because of lack of knowledge and understanding. No new and better thing has ever replaced an old thing without creating a far greater business. Fluorescent lighting as yet only has the potentials for changing the present lighting business. But it has such good potentials that it should be encouraged and developed as rapidly as possible. It is a light that comes nearest to giving the consumer daylight values. It promises to put lighting intensities up to many times present-day recommended values. Greater use will come to unite with higher efficiency to increase revenues.

We know that 30 to 50 foot-candles is about the limit for incandescent lighting because of technical and psychological limitations. We know that the qualities as well as the intensities are not ideal for use by human beings. If the potentials of fluorescent lighting are reached the electrical industry will render a major service to humanity. Fluorescent lighting is cool, soft, capable of having many colors, and for utility and decorative purposes approaches the ideal.

At present fluorescent lighting is in the embryonic stage. It is special and supplementary to other lighting. It has not reached technological or design maturity. But we should use it, develop it and help

nurture it so that some time once again the industry may be able to cite a humanitarian contribution as well as one that brought increased revenues into being.

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Let's Look at Farm Service Again

SOMEWHERE in the national problem of farm electrification there lies a difficulty that prevents approach to a solution along the straight way of business enterprise and that is not perceived with sufficient clarity to give countenance to out and out subsidy. This difficulty, sensed by both and seen in definite terms by neither, is what causes the hard-headed business man to assert that farm service can never be made to pay its way and confirms the earnest do-gooder in his evident intention to push the boon of electricity onto the downtrodden husbandman whether he wants it or not.

Mechanized industry as revealed in our modern factories employs energy as the spring of its functioning, energy that does its work in heating, in lighting, in giving motion to things, in turning wheels, in pushing and pulling, in raising and lowering. This energy is put into the processes of industry in definite forms and quantities and under controlled conditions. Whatever its form, heat, light, motion or electricity, this energy, natural forces shaped by human minds and hands, is the primary animation of industrial production. The energy that moves the industrial machine may be said to be man-made, although it is basically a thing of nature.

But energy as electricity or heat or motion or in any form of man-controlled production and employment is not the primary force of agriculture and husbandry that constitute farming. The essential energy here is life itself, animal and vegetable, controllable only in small degree, almost wholly subject to sun and earth in all their changes. In farming, electricity can be at best only a supplemental energy, useful for lightening labor and for increasing its productivity, but never more than a helper, never the central spring of production as it is in industry.

In this distinction between the aspects of energy in farming and in industry lies that elusive elemental factor in the problem of farm electrification, a factor that has been only hazily perceived alike by the business man who would sell electricity to the farmer and by the vote-hungry politician who would, if he dared, insist on giving it to him—and may do exactly that in the end. If the individual farmer is one among the many who look upon farming as the only way they know for providing shelter and living, then he does not need electricity, can get along sufficiently well without it and wants it only feebly as a housekeeping convenience. But if the farmer is one of the few who regard farming as a business, as more than just a means for obtaining the bare necessities of life, then he does need electricity, does want it and will use it for what it is, a profitable helper supplementing the basic energy of earth and life.

Farming, says one, is a mode of living. Another says farming is an industry. Many farmers believe the first statement and are content to exist within its limits. Electric service to these farmers can never pay its cost and must be a gift if they are to have it. For the few farmers who look upon farming as an industry electricity can be a highly profitable helper and profitable as well to the supplier of the service.

Perhaps it is time now to re-examine, to re-investigate the problem of farm electrification, to discover and to state its terms in the light of experience gained in the past few years.

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Residential Feeders Need Correction

IMPROVED service and more revenue may be had by raising the power factor of residential feeders. The use of many small motors in homes has caused the power factor to drop to as low as 60 per cent in many instances. This gives poor voltage characteristics and limits the revenue load carrying capacity of the feeders.

Many distributing systems are now so loaded that added capacity is needed. An economical way to meet the situation is by use of power-factor corrective devices at the ends of the residential feeders. By the expenditure of around ten dollars per kva. added capacity is gained all the way back to the generating station and increased revenue may be had from this fact and the better voltage characteristics. Several properties have found power-factor correction economical, although how much correction to add is a specific engineering and economic problem. This practice should increase when, and if, other properties make surveys to get similar data on feeders.

COMING! Electrical World's *Prize Picture Contest*

Watch for complete announcement in ELECTRICAL WORLD, February 25, 1939, of prizes, conditions and rules for photographic competition open to all electric utility employees.

News OF THE WEEK

Manufacturers See Business Rise as New Electric Uses Gain Favor

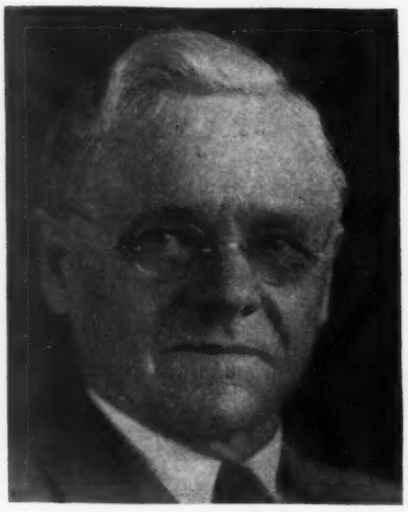
NEMA President Peirce tells meeting in New York that there are many reasons why industry should be optimistic about prospects — Points to advances in products — Johnson receives 50-year certificate

There seem many reasons why the electrical manufacturing industry should feel mildly optimistic about 1939, Carl L. Peirce, Jr, president of the National Electrical Manufacturers Association, told members at their mid-winter meeting this week in New York. More than 500 representatives of electrical manufacturers in all sections of the country were present during the sessions of more than 150 separate group meetings.

Mr. Peirce, who is president of Hubbard & Company, stated that many factors point to better business for the industry. He said that residential building is increasing, the desire for living electrically is more widespread, the demand for electric service is growing and utility modernization and expansion is continuing, although still restricted.

Painting a bright picture of the future, Mr. Peirce told the NEMA meeting that the research laboratories of the members of the association have been especially active and each day sees some new development bringing increased benefits from the use of electricity and constantly lowering its cost. These things, he said, are ever widening the circles of uses and users. "New generating and transmission facilities will be added by the new defense program and replacement sales of appliances have been increasing," Mr. Peirce declared.

It was pointed out by Mr. Peirce that "NEMA is enthusiastically cooperating in the national efforts to increase the sale of electric ranges, water heaters, refrigerators and other household appliances, for modernized kitchens and adequately wired homes. With independent and government economists predicting general business improvement from 10 to 15 per cent, the electrical manufacturing industry estimates that its improvement over 1938 may reach as much as 25 per cent."



John A. Johnson

At the policies division session Blackwell Smith, of Wright, Gordon, Zachry & Parlin, urged the association to join with the Temporary National Economic Committee in its present investigation. He said that the subject matter coming before the TNEC, properly viewed, is a study of unemployment of men, machines and money—a study of depression. "I claim that we must master the tendency to disastrous depressions; in other words, master the business cycle or it will master us."

Mr. Smith said that since the electrical manufacturing industry is largely involved in producing such durable goods, help on depression prevention and cure is most vital to the industry. He called for a three-way collaboration between the TNEC, major trade associations and the Department of Commerce in order to hasten the day of healthy teamwork between government and industry.

George E. Cleary, of Root, Clark, Buckner & Ballatine, told the meeting that the people of the country have become decidedly tax-conscious in recent years. He said that this is the inevitable result of the increasing burden of taxation. This public interest, he declared, makes for economy in cost of government and the development of a sounder plan of taxation.

At the annual dinner John A. Johnson, president of Kuhlman Electric Co., Bay City, Mich., received from Mr. Peirce a certificate signifying fifty years in the electrical industry. Mr. Johnson was superintendent of the first electric plant installed by the Auburn Mining Co. in 1888. For the next five years he operated and was in charge of constructing and placing in operation electrical plants for his company at Butler, Nappanee, Garrett and Kendallville, Ind. In 1893 he joined the late Etna Kuhlman in the sale of transformers; in the following year he participated in the formation of the Kuhlman Electric Co., and since then has been active in manufacturing transformers.

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Columbia Gas Files Plan of Integration

Columbia Gas & Electric this week filed an application with the SEC for approval of a plan of integration of its properties to comply with the utility holding company act. Columbia would dissolve certain of the companies in the system and merge their operations with others.

Notices have been sent to stockholders of a special meeting March 7 to vote on the plan to reduce the capital represented by the common stock from $194,349,005 to $12,304,282 and create a special capital surplus.

TVA Controversy Ends As Agency Buys Tennessee Utility Properties

Willkie closes deal to sell subsidiary for $80,000,000 — Move seen as bringing peace after five-year legal battle — President Roosevelt hails plan as an excellent solution to difficult problem

A new utility empire, under the operations of the Tennessee Valley Authority, appears in the making as final negotiations for the sale and transfer to TVA of the electric facilities of Tennessee Electric Power Co., Commonwealth & Southern subsidiary, nears completion. The deal was viewed as bringing peace between the government and the utilities and a step toward working out of a national power policy.

Last Saturday it was announced that TVA had agreed to pay $78,600,000 for the properties, plus earnings for the first four months and certain equipment, which raises the price which the company will receive to $80,000,000, a price which is considered fair to all parties.

Five-year battle ends

The settlement of the TVA question, as regards the Commonwealth & Southern system, brings to a close a five-year battle which has been bitterly fought since the government power agency started operations. It brings peace to a controversy which not only caused heavy financial loss to the harassed utility industry and stopped plant expansion, but frightened business in all lines, because of its competitive threat, and retarded national recovery.

Announcement by the TVA directors that a basis for an agreement to purchase the properties had been reached came close on the heels of the decision of the Supreme Court that the utilities did not have a monopoly in the Tennessee Valley and had no legal cause to contest the power program of the TVA. The decision of the TVA directors in Norris, Tenn., to accept the results of the negotiations between Wendell L. Willkie, Commonwealth & Southern president, and J. A. Krug, TVA chief power engineer, representing David E. Lilienthal, TVA vice-chairman, came after months of efforts to adjust differences.

Representatives of the TVA, municipalities and utility executives will meet in the near future to draft the formal contracts for the transfer of the electric properties from private to public ownership and operations. The TVA announced that the municipalities will have free choice to participate in purchase of the Tennessee utility facilities.

Reaction to the announcement that the TVA controversy had been settled was highly favorable in every quarter. Investors eagerly sought utility securities and prices rose sharply on all exchanges. Utility officials were jubilant, as were government officials. President Roosevelt put his stamp of approval on the agreement by saying that it was an excellent solution to a difficult problem.

Out of the Tennessee utility sales Commonwealth & Southern will get approximately $80,000,000, which includes $78,600,000 for the electric facilities, $400,000 for the new Tennessee Electric Power 20,000-kw. turbine now in the Schenectady shops of General Electric, $600,000 inventories and supplies and approximately $400,000 net earnings for the first four months this year.

Mr. Willkie pointed out that from the funds received the company will be in a position to pay off at par the $48,000,000 of bonds and the $23,766,700 of preferred stocks. This will leave the corporation with about $8,000,000 for the common stock of the Tennessee company, of which 99 per cent is owned by Commonwealth & Southern.

The deal constitutes a recognition by the government of the value of equity securities; of going concern, and the soundness of purchasing utility properties as systems, rather than the "piecemeal" procedure at knockdown prices, which was the root of the controversy.

Negotiations are soon to open looking toward the purchase of certain properties of the Mississippi Power and Alabama Power companies. Thomas W. Martin, president of Alabama Power, stated this week that negotiations are to open next week. Original properties involved in the Alabama area had a value of $10,000,000 to $12,000,000, but more recent conversations had included properties valued at more than $40,000,000. One of the main obstacles yet to be cleared in the present and proposed sale of utility properties in the TVA area is the line to bound TVA operations.

The clearing of the TVA situation is expected to open a major boom in utility expansion and purchase of electrical equipment. Many business leaders believe that a new wave of business improvement will soon get under way to speed industrial recovery in all lines.

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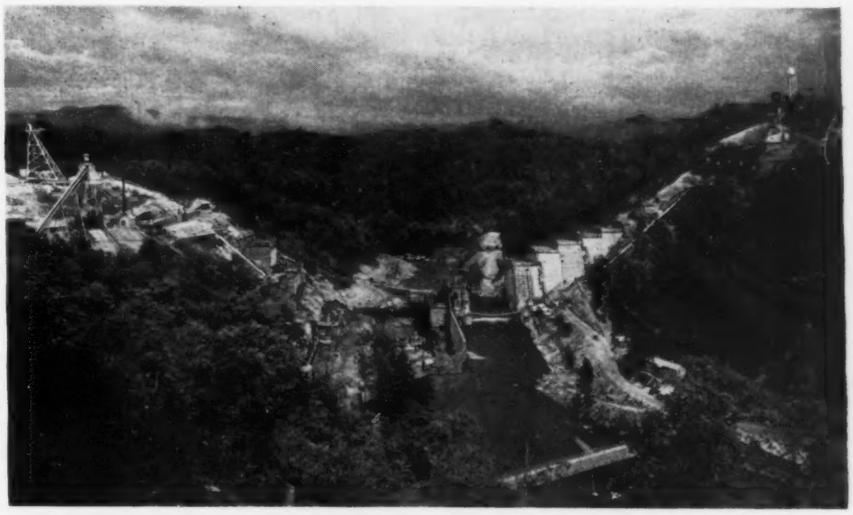
House Cuts $17,392,977 From TVA Dam Proposals

Funds for work on the Gilbertsville Dam, for a dam project at Watts Bar on the Tennessee River and for a survey of dam sites at Coulter Shoals were eliminated from the Independent Offices Appropriation Bill as passed by the House this week. The uprising against the administration cut $17,392,977 from the funds sought by TVA. The House rejected the budget proposal for $12,503,000 for the $95,000,000 Gilbertsville Dam. The vote was 159 to 122. Last year the House cut the appropriation, but it was restored by the Senate.



HIWASSEE DAM—One of the giant power projects of TVA which will form an important link in the new power system which the TVA is buying from Tennessee Electric Power Co. The dam will have an initial 57,600 kw. and possible 115,200 kw. installed capacity. It is to be completed in 1940 at cost of $20,000,000

Construction Budget Increased by Pennsylvania Power & Light

Company to spend approximately $3,000,000 on general work — Plans no major increase in generating capacity — Will spend $100,000 on substations — Plans to build 300 miles of new rural lines

Construction expenditures of the Pennsylvania Power & Light Co. for this year will total approximately $3,000,000, as against about $2,400,000 during 1938, according to L. W. Heath, vice-president.

Mr. Heath pointed out that there will be no spectacular expenditures during the year and no major increase in installed generating capacity is being contemplated. However, there will be some increase in substation capacity, probably in the neighborhood of 7,400 kva at a cost exceeding $100,000.

Builds rural lines

During 1938 the company added about 400 miles of rural lines and ended the year with a total of approximately 7,150 miles of rural lines. During the year the company added 5,641 new rural customers, including farm, to bring the total of all rural customers to approximately 81,600.

The extent of rural electrification carried on by the company is shown by the fact that during the past twelve years the number of miles of line and service has increased 650 per cent; number of rural customers increased 400 per cent, and the number of farm customers served has increased 800 per cent. It is probable, Mr. Heath said, that rural line extension this year will not be less than 300 miles, and that 3,000 to 4,000 new customers will be added to new and existing lines.

District representatives in rural areas assisted in the sale of about 5,000 electric farm devices sold by dealers during last year. The devices had a value in excess of $370,000 with an estimated annual revenue to the utility of approximately $50,000.

Cooperates with dealers

The company follows the policy of close cooperation with the electrical appliance dealers in the territory, of which there are 1,200 of various types. Major appliance sales by the utility and dealers during 1938 included 3,900 electric ranges, 2,600 gas ranges, 750 electric water heaters, 500 automatic gas water heaters, 17,200 automatic refrigerators in addition to 149,000 miscellaneous small appliances.

The merchandising policies of the company do not permit premiums, special discount, special allowances or other practices which offer objectionable competition to retail dealers, Mr. Heath said.

An industrial development department, maintained by the utility and which assists communities to secure new industries, was instrumental in locating approximately 80 new industries in 50 different communities. These new industries will employ about 8,000 persons with an estimated annual total pay roll of $5,400,000.

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New Unit Completed by Porto Rico Utility

Construction work on the installation of additional generating facilities at the Santurce steam plant of the Porto Rico Railway Light & Power Co. has been completed. Work on the installation of a 5,000-kw., 6,250-kva., 8,000-volt Westinghouse turbo-generator as an addition to the company's generating facilities began last April.

The new unit has been installed complete with a new 75,000-lb. per-hour Foster-Wheeler boiler, operating at 400 lb. pressure.

Construction work was carried out by the local organization under the supervision of the Montreal Engineering Co., Ltd., at Montreal. This unit is the largest steam unit yet installed in Puerto Rico and its installation was made necessary by increasing load on the company's system, according to P. W. Raymer, vice-president and general manager.

•

Prudent Investment Theory Advocated by R. H. Jackson

Renewed support to the "prudent investment" theory of public utility valuation for rate-making purposes was given this week by Robert H. Jackson, United States Solicitor-General, in a brief filed with the Supreme Court in connection with a hearing on the validity of a rate order against the Edison Light & Power Company by the Pennsylvania Public Utilities Commission.

In his brief, filed "as a friend of the court," Mr. Jackson asked the court to reconsider a decision, followed for forty-one years, that reproduction cost must be considered along with the original cost in determining the fair value of utilities. "The rule of prudent investment," he said, "is the standard for rate-making best adapted to modern business conditions and practice in this country."

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Carmody Says REA Has Aided Business

REA points out in its annual report covering operations during the 1938 fiscal year that in the three years from its creation the number of farms in the country receiving central station electric service has nearly doubled. REA now has more than 340 projects energized, as compared with only about 50 in operation in July, 1937. The lines serve an estimated 750,000 rural people.

Administrator John M. Carmody points out in the report that, including construction to the end of the calendar year 1938, some 70,000 miles of REA-financed rural electric lines, reaching every type of farming region in 43 states, are in service. Before the REA program was expanded through the additional appropriation of $100,000,000 for the 1939 fiscal year a cumulative total of $87,719,209 had been allotted for the construction of rural lines and a few small generating plants and to finance farmstead wiring and plumbing.

From the beginning of the 1939 fiscal year to October 31, 1938, Mr. Carmody says, more than $65,000,000 was allotted. This is more than twice the amount allotted together in the entire preceding fiscal year. Mr. Carmody says that more than 85 per cent of REA loans have been made to non-profit co-operatives and nearly 10 per cent to power and irrigation districts, municipalities and other public projects. Private utility companies have received about 5 per cent of the total loans.

The amount of business which electrical equipment manufacturers have received from REA expenditures is shown in the report as more than $57,000,000 in conductors, hardware, poles, transformers, generating equipment and plant material, meters, and for wiring and plumbing. Mr. Carmody says that these expenditures have stimulated industrial activity and provided employment in areas far from the farm.

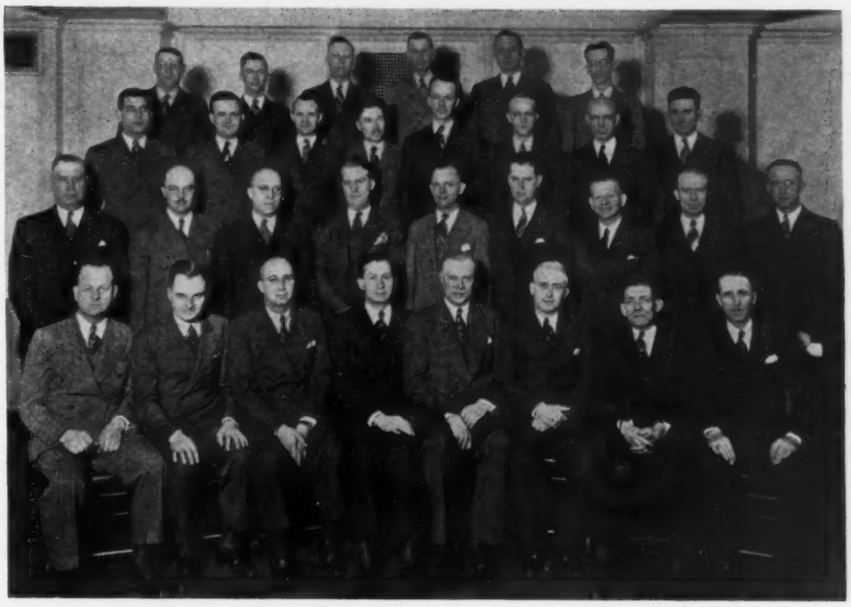
Mr. Carmody stated that if Congress makes the $40,000,000 appropriations recommended in the 1940 budget the REA will add another 80,000 miles of line before the end of 1939.

Missouri Valley Body Studies Power Sales

A thorough study and discussion of power sales problems and technique in meeting competition was led by various representatives from the utilities of the five states covered by the Missouri Valley Electric Association at the recent power sales conference in Omaha. W. H. Stueve, Oklahoma City, presided at the meeting.

F. E. Smith, Omaha, related the negotiations and sale of steam and electricity to the meat packing industry by Nebraska Power. A symposium of Diesel power costs, together with an analysis of the ASME oil engine cost report attracted a great deal of attention. An evening session was held for the consideration of selling methods and tactics.

Unusual for this group was an inspection trip through the world's largest lead refining plant, and through the Nebraska Power Company's new steam-electric station which supplies steam to Omaha's packing houses. For the first time, representatives of electrical manufacturing concerns were provided a place on the program, bringing some new slants on the relationship between power salesman and user.



GRASS ROOTS—Power salesmen at their recent sales conference of the Missouri Valley Electric Association tackled many problems and technique in meeting competition. Representatives of the utilities of the five states were present

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Douglas Denies Reports He Will Resign SEC Post

Reports that he would resign soon as chairman of the Securities and Exchange Commission have been denied by William O. Douglas. Reports were to the effect that Mr. Douglas would resign as chairman of the commission and become dean of the Yale law school. The splendid work which Mr. Douglas has accomplished in carrying out the provisions of the securities act and the utility act has won for him the high esteem of the financial centers of the country and of the utility industry, as well as praise in government circles.

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Court Upholds High Point in "Contempt" Decision

The city of High Point, N. C., received permission from the North Carolina Supreme Court recently to proceed with its modified plan for the construction of a hydro-electric plant on the Yadkin River.

The issue was whether the modified plan was substantially the same as the original plan, which had been restrained by the Duke Power Co. When officials attempted to proceed with the modified plan the Duke company brought a contempt of court action, alleging that High Point was violating the tribunal's ruling of 1937 which held that the city could not issue revenue bonds to go into the "power business generally."

The court's recent opinion dealt only with the contempt issue. Chief Justice W. P. Stacy held in effect that the modified plan was not restrained and that the city was not in contempt.

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Permits Portland Utility to Buy Mt. Hood Properties

Purchase of the properties of the Mt. Hood Electric Co. in Oregon by the Portland General Electric Co., merger of its electric facilities with and the transfer to the purchaser of license for Project EP-1001, have been authorized by the FPC.

Mt. Hood Electric Co. owns and operates a transmission and distribution system in Clackamas County, Ore. It purchases its electric energy wholesale from the Portland company and there is a physical connection between the lines of the two companies. The company owns and operates, under FPC license, a wood-pole, 6,600-volt transmission line located largely upon United States lands within Mt. Hood National Forest, designated as Project EP-1001.

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Directors Name Lilienthal

David E. Lilienthal has been named vice-chairman of the Tennessee Valley Authority by the board of directors.

Hetch Hetchy Vote Being Sought in May

With the granting of a second continuance of the effective date of the injunction against San Francisco's disposal of its Hetch Hetchy power through Pacific Gas & Electric Co., pending court action on the city's application for a rehearing of the case, efforts to arrange for an immediate municipal power election appeared stalemated. In the meantime application of the injunction has been postponed until March 27 to allow attorneys 60 days in which to present briefs in the Appellate Court.

Supervisors find themselves unable to call a special election because of a shortage of funds in the special account to provide for such a contingency. Only alternative is the circulation of petitions asking for a vote on a proposition to purchase the P. G. & E. San Francisco distribution system. Labor leaders have filed a notice of intention to circulate initiative petitions for a vote on May 6 on a charter amendment authorizing the issuance of $22,000,000 in revenue bonds to provide partial municipal distribution. Such petitions would require 37,890 signatures as well as approval by the board of supervisors.

Thus far the supervisors have refused to act upon a $55,000,000 bond proposal submitted by the city utilities' department. This would call for outright purchase of all P. G. & E. distribution facilities within the city, as well as additional generating and transmission facilities.

Urge Power Salesmen to Keep Business Eye

Power salesmen were cautioned this week by H. S. Bennion, assistant managing director of the Edison Electric Institute, to keep a weather eye on the way industry is going in order to keep pace with developments.

At the monthly meeting of the Interstate Power Club in New York, Major Bennion pointed out that purchased power is a necessary auxiliary to industry and whatever affects industry—legislation and politics, business conditions, war and war rumors—must inevitably be reflected in industrial power purchase. He declared that it is to the advantage of the power salesman to know and be conversant with the changing times and events which determine the operations of his present and prospective customers.

James A. Danver, in charge of the World's Fair division of the New York and Queens Electric Light & Power Co., discussed the many problems in supplying power to the fair. Mr. Danver personally conducted the members of the club on a tour of the fair.

•

Withdraw FPC Application to Consolidate Facilities

Lexington Utilities Co. and Kentucky Utilities Co. have filed an instrument to withdraw their joint application filed with the FPC on September 26 for authority under Section 203 of the Federal Power Act to merge or consolidate all of their facilities subject to the jurisdiction of the commission under said act.

The application is withdrawn for the reason that the SEC has jurisdiction over all transfers and acquisitions of properties which will result from or be made in connection with the proposed consolidation and because, under provisions of the Federal Power Act, the FPC has no jurisdiction in connection with the proposed consolidation.

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Provincetown Abandons Public Ownership Move

Citizens of Provincetown, Mass., fishing and resort town on the tip of Cape Cod, have abandoned a movement looking toward the establishment of a municipal electric lighting plant. Arrangements have been made for continued operation of the existing 1,263-kva., four-unit Diesel-electric station on the outskirts of the town by the Provincetown Light & Power Company. Work has been discontinued on the proposed 22-kv. line which had been planned to tie the Provincetown utility into the Cape & Vineyard Electric Company's system.

The New England Gas & Electric Association, which operates the Cape Cod properties, plans to go ahead with the previously announced 110-kv. and 44-kv. transmission line and substation construction between the Cape Cod Canal, Hyannis and Orleans districts. In 1937 the Provincetown company generated 2,637,100 kw.-hr. and had a peak load of 900 kw.

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Bonneville Calls for Bids on Line Construction Job

Bids on the construction of the 220-kv. twin circuit from Bonneville Dam to the major substation at Vancouver will be opened on February 21, Administrator J. D. Ross announced last week. The first of the two circuits is to be completed within 180 days from the date of the award and the second is to be completed within a 210-day period.

Specifications cover the construction of tower footings, the erection of 374 steel towers and the stringing of 1,271,000 ft. of conductor cable. Towers, conductors and insulators will be furnished by the Bonneville project.

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Duke Power Starts Work on New Steam Power Plant

Construction of the Duke Power Co. new steam-generating plant at Cliffside is under way and is scheduled for completion and operation June 1, 1940, according to Charles I. Burkholder, vice-president and chief engineer.

Mr. Burkholder stated that the new plant will consist of two 50,000-kva., 3,600-r.p.m., hydrogen-cooled, 900-lb., 900-deg. F. turbines, together with one boiler, with complement of burning and pulverizing equipment for each unit. Turbines, boilers and most auxiliary equipment have already been purchased and actual work is under way.

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Approve New Tacoma Units

Further improvement and modernization of Tacoma City Light system were indicated when the Council approved first reading of an ordinance appropriating $135,000 from the light fund for new equipment for the Cushman and Nisqually plants. The ordinance authorizes the board of contracts to call bids on a high-tension switch system for Cushman plants 1 and 2, and at the Cushman substation; low-voltage switches, oil system, for the Nisqually plant, and six 4-kv. switches for the Adams St. substation.

Ross Reveals Plans for Northwest Grid

By the time the Bonneville plant is completed the Pacific Northwest will be ready for twice as much electric power as the project will be able to produce. This was the forecast of Administrator J. D. Ross of the Bonneville project in his first annual report to Congress, submitted through Secretary of the Interior Ickes.

The report tells of the Bonneville wholesale rates, which are based on the allocation of costs made by the Federal Power Commission in conformity with the law. Wholesale rate schedules were drawn by Administrator Ross following the issuance of the allocation order and were confirmed by the Power Commission. These schedules were drawn and based on the recovery of the cost of producing and transmitting Bonneville energy. These rates are: Transmission system, primary power, $17.50 kilowatt-year; secondary power, $11.50 kilowatt-year; option rate, ½ cent kilowatt-hour. At site rates: Primary power, $14.50 kilowatt-year; secondary power, $9.50 kilowatt-year.

Twenty-five power districts have been organized in Washington, the report states. All of these districts are negotiating with the private power companies for the acquisition of their properties. On the completion of the present authorized transmission lines at least six of these county-wide districts will be in a position to take Bonneville power. In Oregon two districts and six municipalities have requested service.

The administrator has recommended to the districts that in purchasing power lines of private companies they acquire these facilities as an integrated system.

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Mississippi Utility Opens New Relations Department

Mississippi Power & Light Co. has inaugurated a new department to be known as the customer and personnel relations department, a new division of the general sales department.

The scope and basis objectives of the new department are to function as an executive group and be responsible for all customer and personnel relations development activities.

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Air-Unit Installations

Sales of central plant air-conditioning systems in Chicago in 1938 numbered 315 of 4,903 hp., compared with 379 installations of 12,337 hp. aggregate capacity in 1937, Commonwealth Edison Co. reports.

L.E.S. Plans Joint Meet with A.S.M.E.

The American Society of Mechanical Engineers together with the Louisiana Engineering Society is planning to hold a joint meeting in New Orleans on February 23-25 at the St. Charles Hotel, New Orleans. Industrial development and progress in the South will be the main subject of many of the technical papers at the A.S.M.E. sessions. In addition to joint sessions with the Louisiana society, a luncheon and joint session on engineering education will be held by the A.S.M.E. with the S.P.E.E. on February 23.

A. C. Klein, Stone & Webster Engineering Corp. and Thomas E. Crossan, Gulf States Utilities Co. will discuss "Economics of Power Plants for Joint Utility and Industrial Service" before the A.S.M.E. "Development by Pacific Gas & Electric Co. of Power and Steam for Oil Refinery Service", will be the subject of a talk by C. E. Steinbeck, P.G. & E. Harry R. Pearson, Dallas Power & Light Co., will discuss the Mountain Creek Steam Electric Station as an example of semi-outdoor construction.

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Electric-Gas Association Elects Officers for 1939

A. Lincoln Bush, president of Belmont Electric Co., Inc., was re-elected president of the Electrical and Gas Association of New York, Inc., at its annual meeting, held recently at its headquarters in Grand Central Palace.

Other officers elected includes: E. F. Jeffe, Consolidated Edison, first-vice-president; J. H. McKenna, A. J. Lindemann & Hoverson, second vice-president; Hugh Cuthrell, Brooklyn Union Gas, third vice-president; David S. Youngholm, Westinghouse, fourth vice-president; P. S. Van Bloem, Viking Lights, treasurer; S. J. O'Brien, S. J. O'Brien Sales Corp., secretary, and H. C. Calahan, General Electric Supply, assistant secretary.

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Hoover Praises Engineers

Former President Herbert Hoover, addressing the alumni of Stevens Institute of Technology at their thirty-sixth annual dinner at the Hotel Astor, New York, last week, credited the engineering profession with destroying politically created "national demons," and cited the hydro-electric power industry as an example of the engineers' triumph over a political bugaboo. The Federal government, he prophesied, would "waste a few more billions of taxpayers' money" on hydro-electric plants before it discovered the engineers had developed cheaper fuel sources.

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Three Winners Announced

H. L. Martin, manager Modern Kitchen Bureau, has announced that three winning letters for December, 1938, have been chosen from the many submitted in the bureau's contest on "How I Sell Electric Water Heaters." The three men winning $10 each for their letters are: R. N. Mitchell, Wisconsin Electric Power Co.; Frank H. Haywood, Utah Power & Light Co., and Louis Brunnell, Connecticut Light & Power Co.

Meetings

American Institute of Mining and Metallurgical Engineers—Annual meeting, New York, N. Y., February 13–16. A. H. Parsons, secretary, 29 West 39th St., New York, N. Y.

Louisiana Engineering Society — Annual meeting, St. Charles Hotel, New Orleans, La., February 23–25. A. M. Hill, secretary-treasurer, St. Charles Hotel.

American Society of Mechanical Engineers —Spring meeting, St. Charles Hotel, New Orleans, La., February 23–25. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

American Society for Testing Materials—Regional meeting, Deshler-Wallick Hotel, Columbus, Ohio, March 8. Committee Week, Deshler-Wallick Hotel, March 6–10. R. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

Northwest Electric Light and Power Association—Business development section, Portland, Ore., March 16–18; engineering and operation section, Seattle, Wash., April 19–22; accounting and business practice section, Vancouver, B. C., May 26–27. Berkeley Snow, secretary, 707 Spalding Bldg., Portland, Ore.

Edison Electric Institute—Sales committee, Edgewater Beach Hotel, Chicago, Ill., March 20–24. Bernard F. Weadock, managing director, 420 Lexington Ave., New York, N. Y.

Oklahoma Utilities Association — Annual convention, Tulsa, Okla., March 20–21, Kate A. Niblack, secretary, 625-626 Biltmore Hotel, Oklahoma City, Okla.

Association of Iron and Steel Engineers —Spring conference, Tutwiler Hotel, Birmingham, Ala., March 27–28. Brent Wiley, managing director, Empire Building, Pittsburgh, Pa.

Southeastern Electric Exchange — Annual conference, Ponce de Leon Hotel, St. Augustine, Fla., March 30–April 1. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta, Ga.

Missouri Association of Public Utilities—Annual convention, Muehlebach Hotel, Kansas City, Mo., April 12–14. Jesse Blythe, assistant secretary, Merchants Bank Bldg., 101 West High St., Jefferson City, Mo.

Maryland Utilities Association — Spring meeting, Lord Baltimore Hotel, Baltimore, Md., April 14. Warren D. Haley, secretary, 16 Carroll Av., Takoma Park, Md.

Electrochemical Society—Spring convention, Columbus, Ohio, April 26–29. Dr. Colin G. Fink, secretary, Columbia University, N. Y.

McEachron Tells of Lightning Studies

Information that has been valuable in affording better protection to transmission lines and other apparatus has been obtained from recent comprehensive studies of lightning, both natural and artificial, Dr. Karl B. McEachron, General Electric Company, told members of the Franklin Institute last week.

For the past three years, Dr. McEachron reported, studies have been made of natural lightning striking the Empire State building, a high-speed camera having been used to photograph the strokes. These studies have been supplemented with investigation of man-made lightning at the Pittsfield laboratory.

One of the most interesting facts the study has disclosed, said Dr. McEachron, is that the shape of the object struck and its height will in many cases determine the direction of propagation of the initial leader stroke. He also pointed out how the photographic results, giving the rate of propagation of a downward step leader stroke, may be used to determine the wave shape characteristics of the discharge itself. Dr. McEachron also discounted the theory that lightning never strikes twice in the same place.

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Program Announced by Operations Group

Announcement has been made that the operations section of the Pennsylvania Electric Association will meet at the Benjamin Franklin Hotel in Philadelphia on March 1 and 2.

At the opening session there will be a discussion of supervisory training activities on the part of various companies. R. D. McKinnis, manager of employment and training, Duquesne Light Co., will discuss the subject from the point of view of large metropolitan companies and H. K. Breckenridge, personnel director, West Penn Power Co., will approach the subject from the widely scattered property angle. Considerable attention will be given to customer relations. "What the Customers Think of Utilities" will be the subject of a talk by Elmo Roper, and Henry R. Flanegan, Philadelphia Electric Co., will discuss "Sampling Customer-Employee Interviews." Brief talks by representatives of various companies will be given to bring out customer relations problems of various jobs. Henry G. Dooley, associate editor ELECTRICAL WORLD, will talk on "Public Relations Brought Down to Earth."

Output Continues at New High Levels

Persistent firmness, in contrast with the usual downward trend at this season of the year, is indicated by the weekly figures on energy output of the electric light and power industry reported by the Edison Electric Institute. Production of 2,287,248,000 kw.-hr. during the week ended February 4 was only 0.2 per cent less than in the preceding week and 0.1 per cent under that of the week of January 21.

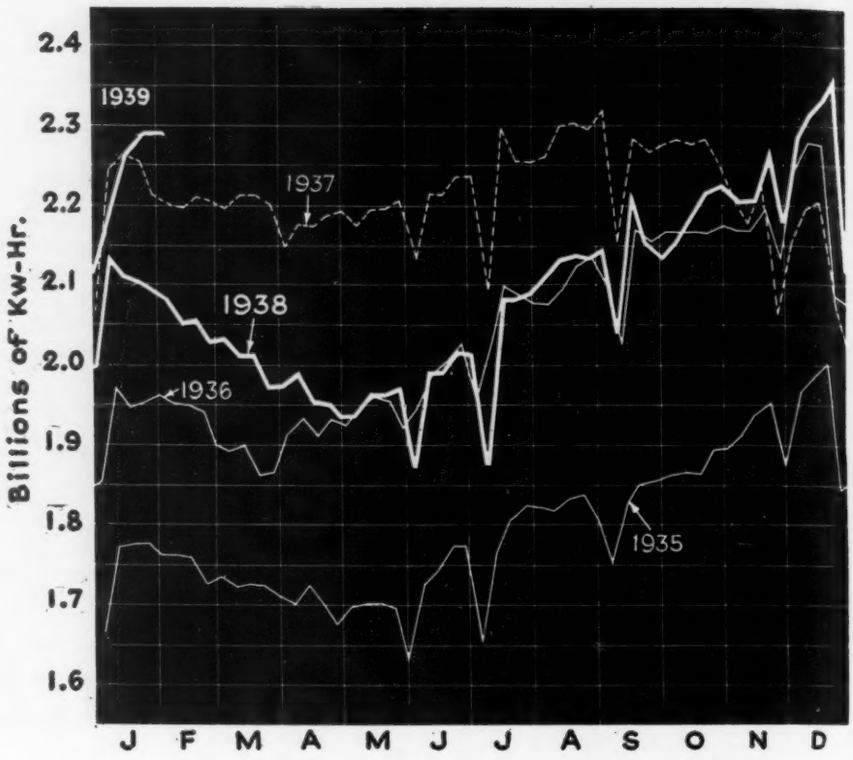
Also, the margin of increase over both 1938 and 1937 continues to widen.

Weekly Output, Millions Kw.-Hr.

1939	1938	1937
Feb. 4..2,287	Feb. 5..2,082	Feb. 6..2,201
Jan. 28..2,293	Jan. 29..2,099	Jan. 30..2,215
Jan. 21..2,290	Jan. 22..2,109	Jan. 23..2,257
Jan. 14..2,270	Jan. 15..2,115	Jan. 16..2,264
Jan. 7..2,169	Jan. 8..2,140	Jan. 9..2,244
1938		
Dec. 31..2,121	Jan. 1..1,998	Jan. 2..2,069

Per Cent Change from Previous Year

Region	Week Ending Feb. 4	Jan. 28	Jan. 21
New England	+17.2	+14.9	+12.7
Middle Atlantic	+10.1	+ 9.0	+ 7.2
Central Industrial	+11.9	+11.9	+11.4
West Central	+ 0.9	+ 0.8	+ 1.2
Southern States	+ 6.7	+ 5.9	+ 6.3
Rocky Mountain	+ 1.8	+ 3.3	+ 4.8
Pacific	+ 7.5	+ 7.7	+ 7.6
United States	+ 9.8	+ 9.2	+ 8.6



The former now stands at 9.8 per cent, the latter at 3.9 per cent. Last week's production was the highest for any February week on record.

Gains over 1938 are particularly noteworthy in the industrial regions, New England leading with 17.2 per cent, followed by the Central Industrial area with 11.9 per cent and the Middle Atlantic with 10.1 per cent. These gains have been increasing in recent weeks.

Increased Capacity, Lower Output in '38

Total production of electric energy in the United States during 1938 amounted to 115,825,000,000 kw.-hr., or approximately 4 per cent less than was produced in 1937, according to preliminary figures reported by the Federal Power Commission.

Of this total, approximately 112,735,000,000 kw.-hr. was produced for public use, as against 117,742,000,000 kw.-hr. in 1937, while the remainder was produced by electric railways and railroads and other miscellaneous plants. Output for public use during December was 10,542,147,000 kw.-hr., a gain of 5.5 per cent over November and of 8 per cent over December, 1937. The normal change from November to December is plus 1.3 per cent, according to the FPC.

While production by use of fuel, amounting to 71,747,000,000 kw.-hr. against 77,348,000,000 in 1937, showed a decrease of 7 per cent, production by use of water power reached an all-time high of 44,078,000,000 kw.-hr., a gain of 1 per cent over the previous year.

Total installed capacity of generating plants available for service as of December 31 was 38,844,000 kw., a net increase of about 1,812,000 kw., or 4.9 per cent, during 1938. Preliminary data on fuel consumption indicate a fuel rate of about 1.42 lb. of coal per kilowatt-hour.

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Power Failure Threatens

Mexico City has learned that its supply of electric power is running low and that only the most drastic measures can prevent a complete failure in April. The water at the Necaxo Dam, chief hydro-electric plant, is at the lowest level in history and no improvement will be possible until the rainy season in June.

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To Honor Elihu Thomson

A meeting in commemoration of the life and work of Prof. Elihu Thomson, who at the time of his death nearly two years ago was recognized as the dean of American scientists, will be held in the halls of the American Philosophical Society and the Franklin Institute in Philadelphia on February 16. Papers, each dealing with a different phase of his life, will be read by nine men high in the scientific and electrical art, who were closely associated with Prof. Thomson during his lifetime.

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Senate Committee Submits Report on Colorado Flood

A dam cannot adequately serve both purposes, flood control and generation of hydro-electric power, was the opinion expressed in a report of a Senate committee appointed by the last legislature to investigate operation of the Lower Colorado River Authority structures. The committee has just submitted its report on the flood of last July which devastated the lower Colorado River valley despite two completed dams. The committee said the testimony it had received showed the two objectives are so incompatible that it is "impossible for a dam to serve both purposes with any degree of efficiency if the purposes are considered of equal importance."

Though it did not attempt to recommend which policy the authority should follow, the committee urged the legislature to formulate a State policy for operation of the dams and to require strict observance.

Proposes Reduction in Common Shares

Engineers Public Service Co. has notified the New York Stock Exchange of a proposed reduction in its authorized common stock by 439,032 shares, from 2,349,0000 to 1,909,968. The company stated that 434,054 shares are no longer needed as a result of expiration of right to convert $5 convertible preferred stock into common and of expiration of the right of the $5.50 cumulative preferred to exercise common stock purchase warrants attached to their certificates. In addition, company would cancel authorization to issue 4,978 additional common shares not now needed.

The $5 convertible shares had reserved for conversion 237,120 common on the basis of 15 new common for 10 preferred. There were also 196,934 shares of common held in treasury for sale at $68 a share to holders of Engineers' $5.50 preferred common stock purchase warrants.

•

Gulf States Files $4,000,000 Issue

Gulf States Utilities Co. has filed a declaration with the SEC covering the issuance of a $4,000,000 note, 3 per cent unsecured. Proceeds from the sale of the note, together with $659,675 of the company's general funds, are to be used for refunding outstanding debentures and to discharge indebtedness to Ethyl Gasoline Corp.

Southeastern Power & Light Co. has filed an application for approval by the commission of the acquisition of $250,000 of 5 per cent 25-year bonds and 3,000 shares of no par common stock of West Memphis Power & Water Co., a Southeastern subsidiary.

Hearing has been set for February 20 on application of Central Illinois Electric & Gas Co. for exemption from the requirement of filing a declaration in connection with the issuance of $2,000,000 of 3¾ per cent notes. The notes are to be sold privately to insurance companies.

Plans for reorganization of a subsidiary holding company of Cities Service Power & Light Co., marking a step toward system simplification prescribed in the Public Utility Act, have been revealed in an SEC announcement which stated that a hearing would be held February 23 on the proposal. The application embraces reorganization of East Tennessee Light & Power Co., a registered holding company and Cities Service subsidiary, so that it will cease to be a holding company and will be solely an electric and gas utility operating company; dissolution of Tennessee Eastern Electric Co. and Tennessee Realty Co. and acquisition of their assets by East Tennessee Light & Power Co.

•

Units to Curb Activity

Utilities Securities Co. and Associated General Utilities Co., companies organized to invest in securities of the Associated Gas & Electric System, have notified the SEC that they would discontinue the sale of their own securities to employees in the system. Their investment funds were derived from contributions made by employees of the Associated system.

•

Associated Suit Dismissed

U. S. Circuit Court Judge Alfred C. Coxe has granted the motion of the Associated Gas & Electric Co. as debtor to dismiss the petition for receivership against the company on the grounds that the petition was not filed in good faith.

PSC Approves Bond Sale of N. Y. Utility

The New York State Electric & Gas Corporation was authorized this week by the Public Service Commission to issue and sell $14,000,000 of its four per cent first mortgage bonds, maturing in 1965.

Proceeds of the bonds, which are to be sold not later than June 1, 1939, will be used as follows: $8,458,500 for refunding underlying mortgage bonds of constituent companies, $3,460,000 for payment of a 4½ per cent note, $1,200,000 for the payment of a 4 per cent note and $881,500 for construction of projects previously authorized. Bonds must be sold at a price "to realize proceeds of not less than 95 per cent of part to the company," according to the order.

The company was also permitted to increase from $100,000 to $150,000 its "evidence of indebtedness" for borrowings under a customer-finance plan for the extension of rural electric lines.

•

Quebec Utility to Finance

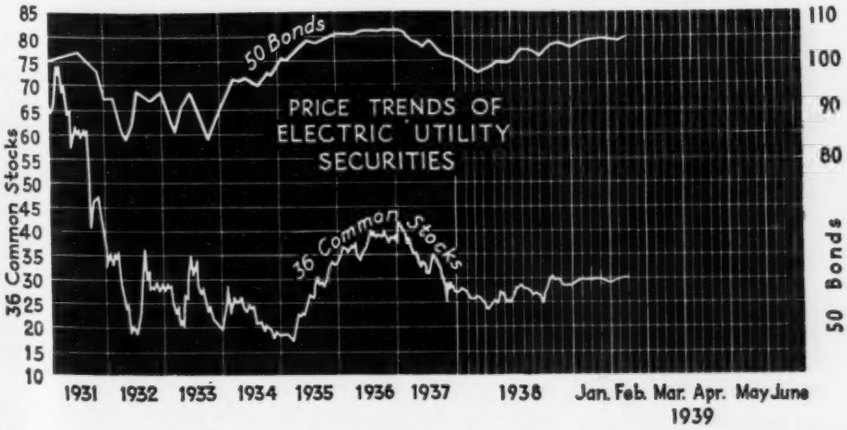
MacLaren-Quebec Power Co. has filed an application with the Provincial Electricity Board for permission to carry out financing in connection with the refunding of the company's first mortgage bonds. Company plans to issue $18,000,000 of 20-year 4 per cent bonds which will refund the present issue of two series 5½ per cent due in 1961 and 1964 of a similar amount.

•

Dividend on Accumulations

A dividend of 37½ cents a share has been voted on the $5.50 dividend series preferred stock of the New England Gas & Electric Association. This dividend is on account of accumulations which on January 3 amounted to $18.50. This is the first payment since 50 cents was distributed on December 24, 1937.

Stocks and Bonds Go to New Highs


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1931 1932 1933 1934 1935 1936 1937 1938 Jan. Feb. Mar. Apr. May June 1939

Under the stimulus of recent developments with respect to the TVA, electric utility stocks and bonds moved upward during the week to new highs for the year. "Electrical World" stock index gained 0.6 point to 30.6, while the bond index was up 0.7 point to 104.6. Monday securities rose sharply and held both of the early gains

Utility Reports (Earnings)

	Net Income 1938	1937
*Cons. G. E. L. & P. (Balt.) and sub.....	$5,853,140	$6,516,403
*Metropolitan Edison..	3,097,167	3,294,825
*New York State E. & G.....	2,382,184	1,868,993
*South Carolina E. & G.....	236,183	279,209
*Central Illinois Lt....	1,900,401	2,224,121
*Eastern Util. Assoc. and subs.....	1,508,071	1,697,372
*Pacific Lighting.....	7,896,323	7,775,077
*Pennsylvania Pwr....	552,364	605,790
*Southern Indiana G. & E.....	928,655	839,458
*Tampa Electric.....	1,501,642	1,458,155

* Twelve months ended December 31.

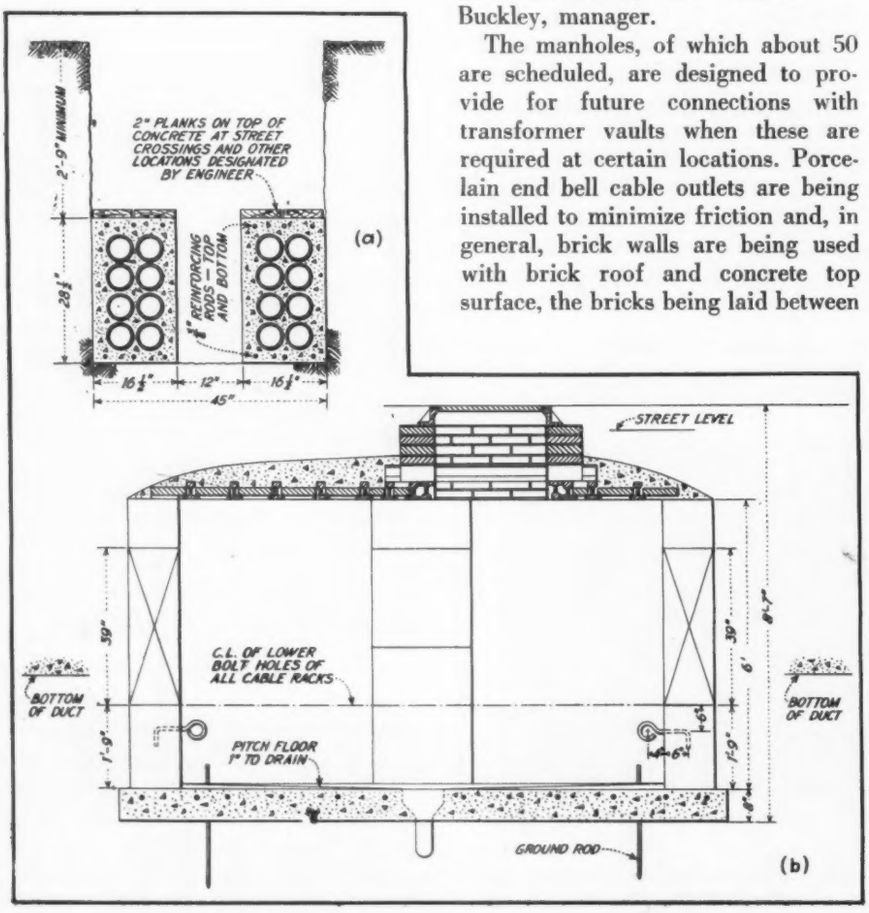
Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed constructed and maintained plants and systems

Build Duct Line for Service Continuity

To insure more reliable service from major feeders now running from the Water Street generating plant to the heart of the industrial and business districts, the Taunton (Mass.) municipal lighting department is building an underground conduit line about 2 miles long to replace the present overhead facilities. Fiber duct laid in concrete, with a twelve-duct maximum per conduit, is being used. Where sixteen ducts are required two eight-duct sections are provided in a trench 45 in. wide with a 12-in. separation between sections to give adequate ventilation. The department is planning to install 25-kva. cable in the main and branch lines to be built. Arthur L. Nelson Engineers, Boston, are consultants, and Chester F. Buckley, manager.

The manholes, of which about 50 are scheduled, are designed to provide for future connections with transformer vaults when these are required at certain locations. Porcelain end bell cable outlets are being installed to minimize friction and, in general, brick walls are being used with brick roof and concrete top surface, the bricks being laid between 60 and 80-lb. rails which support the roof, ring and cover. Drainage is provided to adjacent sewer lines. Ease and speed of laying the brickwork was a feature which led to the use of this material instead of reinforced concrete, although the duct sections are of concrete and are reinforced as indicated, with planking above the ducts for mechanical protection at various points.



Prefer two eight-duct conduit sections (a) to one sixteen. Manhole design (b) provides for future transformer vault connection

•

Reinsulate Coils After Ice-Water Bath

Damage to the insulation of generators in the Ontario Power Company plant of the Hydro-Electric Power Commission just below the Canadian Falls on the Niagara River resulting from the flooding of the plant with ice and water in January, 1938, has made necessary reinsulation of a majority of the machines. An attempt is being made in reinsulating the units to obtain a "waterproof" assembly. The methods and materials being used are here described briefly.

Damage to the field coils was particularly severe. Coil insulation consisted of shellacked paper and asbestos with collars, wedges and ground insulation of vulcanized fibre and laminated wood. This insulation had suffered considerable loss of mechanical strength from high temperatures experienced prior to water and ice damage. Stator or armature coils, not exposed to the same heat conditions as the field coils, in most cases responded to the vacuum drying to which the machines were subjected.

Condition of several sets of bakelite laminated collars installed in 1930

Announcing

a New Kind of POWER FUSE—

Current-limiting

No noise—no discharge of gas, flame, or metal —no emergency vent or muffler.

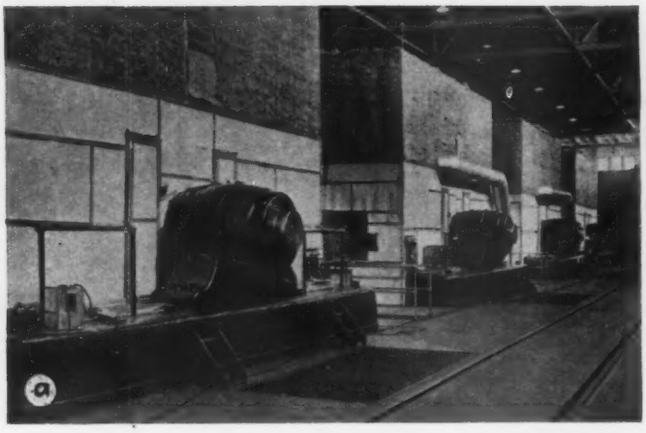
Available for potential transformers and in current ratings up to 10 amperes continuous. Voltage ratings, 2500, 5000, 7500, 15,000, and 23,000. For indoor or outdoor service.

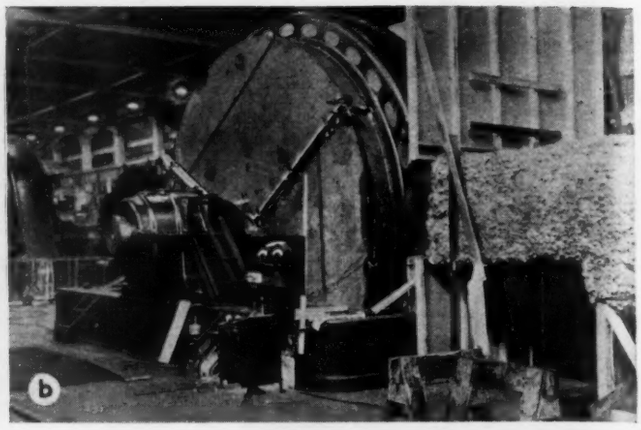
Interrupting ratings as high as 1,500,000 kva at 15,000 volts.

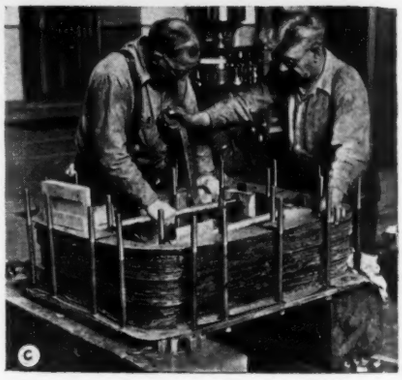
Our Bulletin GEA-3077 describes the application and construction of these new current-limiting fuse units, Type EJ-1. Ask for a copy. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

890-72







Recondition generators at Niagara Falls plant after ice jam

(a) Preliminary drying—Oven built over units and heated air blown through prior to vacuum treatment.

(b) Arrangement for vacuum drying, a 26-in. vacuum in final stages accompanied by highest allowable temperature of 195 deg. F.

(c) Reinsulating field coils; jacks are being used to obtain compression in the coil.

and which went through the ice and water without ill effect largely influenced the engineers in favor of reinsulating the field coils with this material in an attempt to obtain a "waterproof" assembly. The step-by-step procedure followed in reinsulating the field coils follows:

(1) Coil removed and vacuum dried, (2) Scraped clean and tested for turn-to-turn short circuits at 3,000 volts. (3) Where needed, insulation between turns repaired, using asbestos paper and TR-4548.* (4) Coil put under 26 in. vacuum, TV-1112 admitted and allowed to soak four hours after breaking vacuum. (5) Allowed to drain two to four hours. (6) Coil is clamped to pull turns together. At same time wooden form is expanded inside coil by jackscrew to keep turns in alignment. (7) Assembly baked 18 hours at 120 deg. C. and clamps tightened once during cure. (8) Coil removed and checked for "shorts" and repaired. (9) Coil smoothed off to break bubbles and lumps of resin. Done with grinding wheel to gauge inside coil. (10) Bakelite collar molded and cut to shape from built-up strips of 8-oz. duck with 50 per cent impregnation of TR-4548 is varnished with TV-1112 and the coil set on it; another collar is added on top. Collar segments of ☆ and ☆-in. fabric base laminated bakelite the same shape as the collars are introduced to give desired coil dimension. (11) TC-6032 is spread inside surface of coil to give smooth level surface. (12) Inside diameter brought to size with alternate layers of 0.015 in. fine fabric laminated and TC-6032. (13) Coil is clamped as before, using steel-expanding form. (14) Coat of TC-6032 applied to fill irregularities. (15) Assembly baked 18 hours at 120 deg C. (16) Removed and varnished while hot with TV-1112.

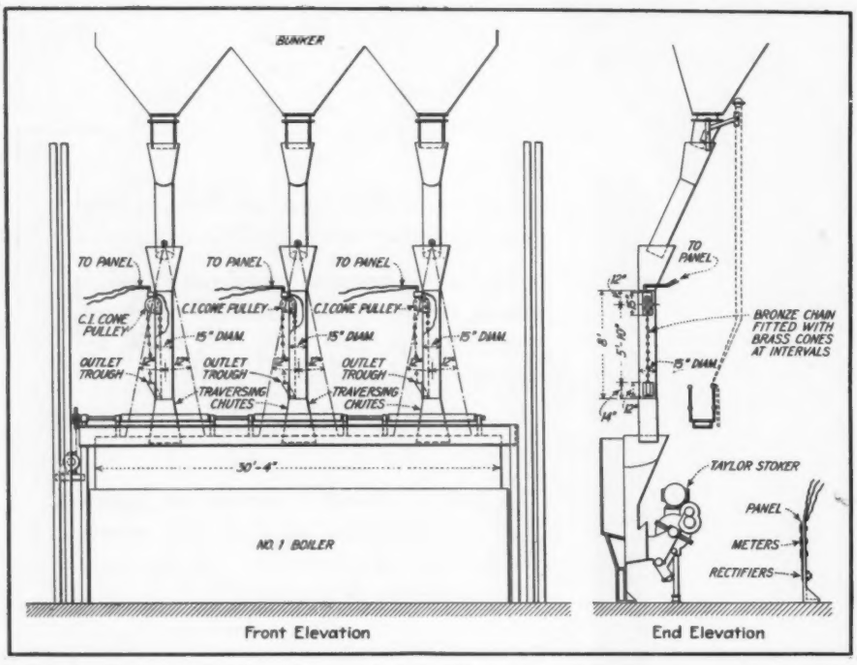
At this point procedure is varied according to the type of generator.

In units with fixed pole pieces asbestos and fabric laminated shapes are fitted at root of and between field poles for bottom heat insulators, the coil assembly slipped over pole and spaces filled with bakelite strips, the ¼-in. asbestos base laminated bakelite pieces of heat insulation placed on top of collars between field poles and bronze wedges driven between pole over coils.

In units with removable pole pieces the coil assembly is slipped over the bottom end of removable field pole and is tightened against field coil and

* All numbers refer to Bakelite materials

VOLUMETRIC COAL WEIGHING AT FULHAM STATION



Volumetric "weighing" of coal, a method based on the interesting premise that equal volumes of most coals have very nearly equal weight, is being used to determine the rate of coal supply to stokers at London's Fulham station, as shown. Coal flowing down an 8-ft. vertical conveying tube to the underfeed, tilted-type stokers drags with it small buckets attached to an endless chain half inside and half outside the conveying tube. As the chain rotates under the action of the moving coal it drives a sprocket actuating a remotely located electrical counting mechanism that registers the rate of coal supply to the stokers. There are 21 of these recorders in Fulham station supplied by the Lea Recorder Company Ltd., Manchester, England. A variation of this scheme is used with chain grate stokers in other stations.

bakelite laminated wedges driven in between coil and rectangular field pole until coil is tight.

•

Insulated Spreaders Prevent Dancing

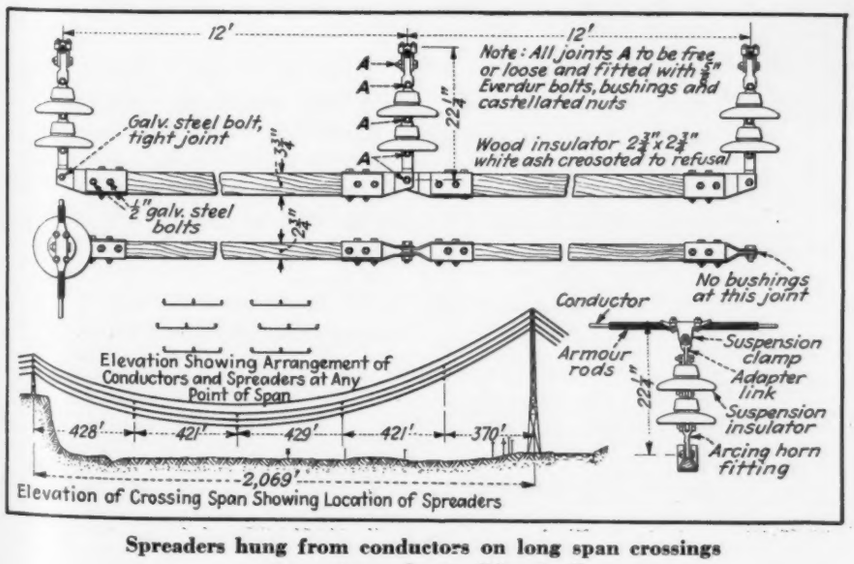
Insulated spreaders have been used in the past to keep small conductors of telephone or low-voltage lines from contacting during conditions of high wind. This principle has been used by the Montreal Light, Heat & Power Consolidated to overcome the danger of arcing between adjacent conductors in the event of "dancing" or "galloping" during sleet storms.

Two important 12-kv. long-span crossings, one over a river, the other over a freight yard, were reported to have danced during sleet storms. Circuit outages supported the reports that the conductors were contacting. Careful inspection of the crossing conductors revealed burns on the outside layers of strands near the center of the span.

To prevent recurrence of these outages the company installed wooden spacers suspended from the conductors at four points along the span. The spreaders, shown herewith, consist of $2\frac{3}{4}$ x $3\frac{3}{4}$-in. creosoted wood members 12 ft. long. At each end suitable metal fittings are bolted, by means of which the spreaders are attached to strings of two 12,000-volt suspension insulators. Insulators are fastened to the conductor by inverted suspension clamps. Where these clamps are attached armor rods are used to protect the conductors from vibration stresses.

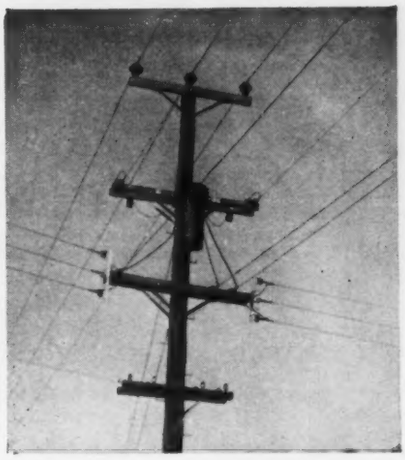
Since installation of these spreaders there have been no outages recorded and no dancing observed under similar conditions which caused severe dancing prior to their installation. Other organizations which have had experience with a similar type of spacer over longer periods confirm these observations.

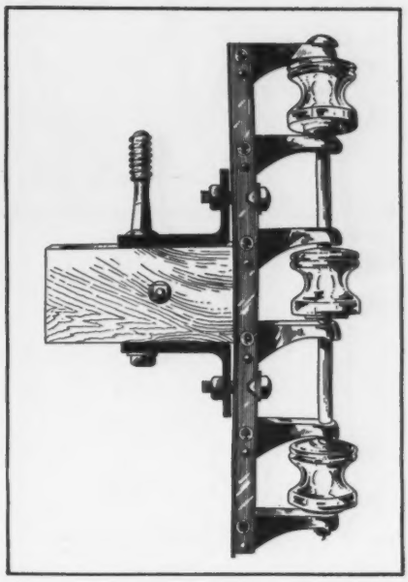
According to a description of this method of decreasing dancing troubles in a report of the Canadian Electrical Association it would not be practical for installation on transmission lines in general, but in cases of special long spans or at points of particular importance it would suit the purpose well.



Spreaders hung from conductors on long span crossings stop outages due to "dancing"

SUBSTITUTE BRACKET FOR BUCK ARM





At points where it is difficult to place a buck arm for taking services off a pole this bracket has been employed to advantage by the Nevada-California Electric Corporation. A standard pole rack is made use of. It is fastened to the crossarm by means of two angle members which are held by a steel-shank pin at the end of the arm. Often the construction eliminates the necessity for an increase in pole height, which would be the only other feasible means of taking off service.

TO REMOVE METER COVERS

Glass meter covers are removed in the laboratory of the Central Vermont Public Service Corporation, Rutland, Vt., with a special wrench built by J. I. Whitney. The design is simple, consisting of two wooden pieces hinged together at one end to form a split handle which encircles the meter cover, the inside diameter of the circle being about 5¾ in. A strip of ⅝-in. tape is tacked around the inside to increase the grip on the glass. The two sections of the handles are normally kept slightly apart by a compressed wire spring, allowing a travel of about ½ in. in closing and opening. The stock is about ¾ in. thick and the over-all length of the device 13 in. A wooden template to hold the meter firmly while removing the cover is attached to the work bench.

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

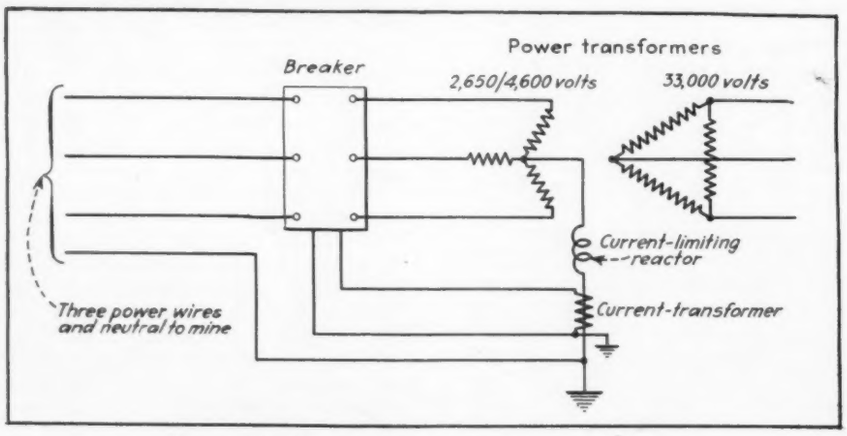
Neutral Reactor a Safety Measure

A reactor in the secondary neutral conductor of the 33 to 2.6/4-kv. wye-connected main transformer bank is being used to limit voltage from strippers or other 4,000-volt-to-ground equipment in case of a grounded phase conductor at the Boonville, Ind., strip coal mine of the Sunlight Coal Company. This installation was made in an attempt to reduce the possibilities of serious or fatal injury from contact with high-voltage equipment.

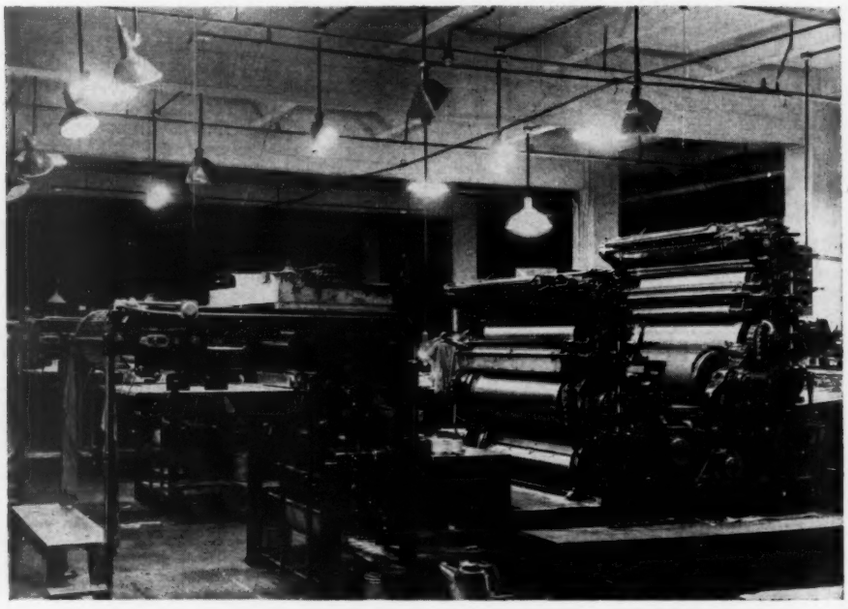
The method of applying the reactor is shown in the accompanying diagram. A reactor is used which is rated at 50 amp., 2,360 volts, 135 kva. and is designed to hold the potential from the stripper frame to about 100 volts in case of a grounded cable or motor.

A five-second ground relay at the power company substation is set to open the utility company oil circuit breaker at 43 amp. neutral current. One-second relays at the pit circuit breakers will open the latter at 20 amp., thus preventing the opening of the main substation breaker except as a last resort.

The practice was described in the December, 1938, Model Mining Number of *Coal Age*.



Current-limiting reactor at transformer substation of strip coal mine reduces shock danger



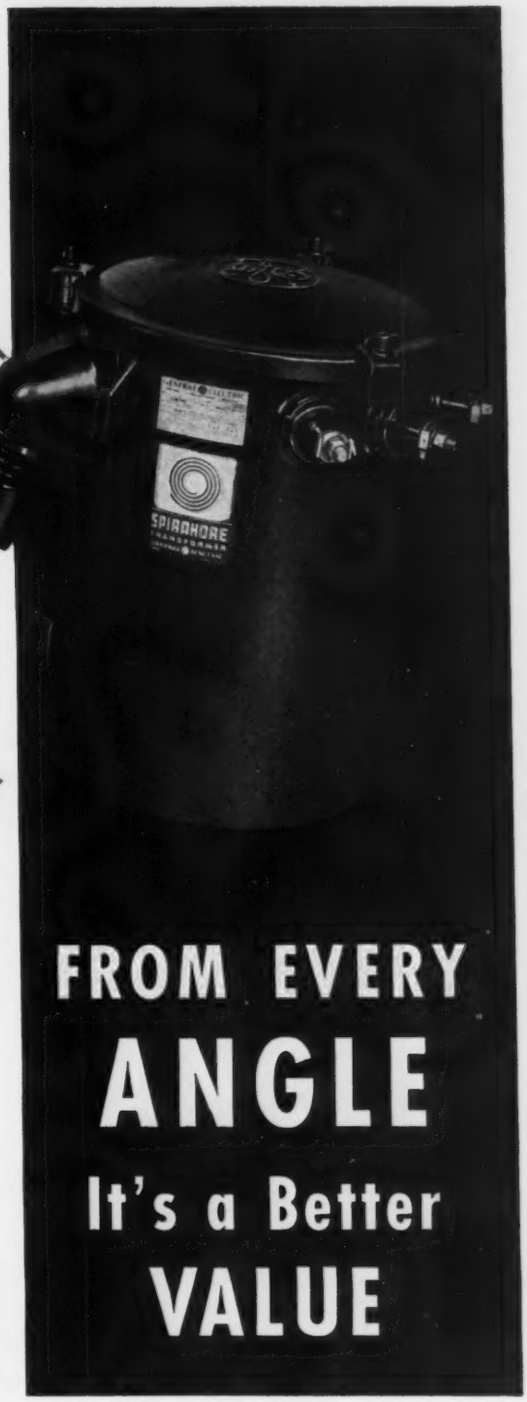
Adjust light to contour of presses in relighting printing plant

Multiplane Lighting Assists Pressman

By HENRY G. NICHOLS
Lighting Division,
Cincinnati Gas & Electric Company

Lithography on high-grade greeting cards and similar forms requires extreme precision in presswork, especially during the makeready. Errors must be picked up speedily to prevent spoilage, which becomes progressively expensive as the later colors are run.

In the pressroom shown the lighting is adjusted to the contour of the presses so that all the working planes are clearly illuminated. In addition, the inspection tables are provided with color corrective glassteel diffusers. Four types of units are used in each bay: Tru-tint and ordinary glassteel diffusers, intensifiers and angle reflectors.



FROM EVERY ANGLE It's a Better VALUE

OUR new SPIRAKORE* transformers are definitely a better value because they give you decidedly better operating characteristics at lower prices. ● Prices are 12½ to 18 per cent lower than superseded designs simply because SPIRAKORE transformers are more economical to manufacture. ● Efficiency at the heavier loads has been improved—the total losses being, in some cases, 10 per cent less. ● Voltage regulation at the higher power-factors has been improved. ● Exciting currents are lower than any previous values. ● The reduction in weight in some ratings amounts to as much as 100 pounds, or 40 per cent. ● Specify G-E SPIRAKORE transformers, identified by the red spiral on the tank. They are available in 1½- to 3-kva ratings. Ask for Bulletin GEA-3085. General Electric Company, Schenectady, N. Y.

**SPIRAKORE is the General Electric trade name for transformers of the new wound-core construction.*

GENERAL ELECTRIC

At an average cost of 1 per cent of the mechanical equipment this lighting job makes night operation as speedy and as accurate as that under full daylight.

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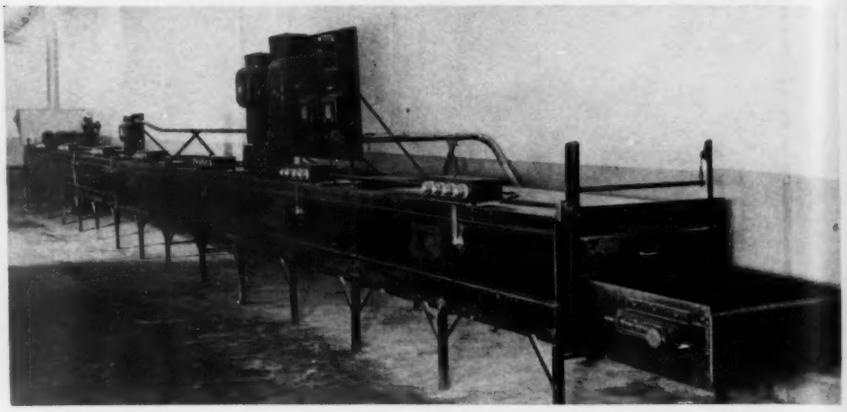
Demand Recorder as Demand Controller

Control of demand is about the most effective way in which the industrial user of electric service can employ that service most economically. Such control usually consists in cutting out a major element of the total load—some large equipment that may be de-energized readily—when the demand reaches a predetermined value. This supervision may be accomplished automatically with devices commercially available, but frequently a solution of the problem is attempted by the combination of local ingenuity and instruments and parts at hand.

Such a combination appears to be working well in two installations in a Middle Western steel mill. The set-up is non-automatic. It consists merely of a company-owned recording demand meter which is watched by the attendant of a furnace from which are taken the heated billets for rolling. When the plant demand rises to a certain point the attendant simply stops feeding billets to the mill for the few remaining moments of the demand interval. With this arrangement applied to two mills an effective control of total plant demand is accomplished.

Yet the set-up has a certain deficiency. The attendant with his job of handling the furnace to attend to cannot keep his eyes glued on the comparatively small area of the field of indication of the demand instrument. He has a lot of other things to watch, too. Therefore the demand recorder is equipped with means to attract the attention of the attendant. This means consists of a group of three lamps, white, green and red, operated by contacts within the instrument. While the demand remains below the permissible value, the white lamp burns and all is well. The red lamp signals the demand limit, time to stop billets into the mill. As the load drops by this cessation of work, the green light comes on and remains until the demand interval is finished, when the white lamp relights.

INDUSTRIAL BAKEOVEN OPERATES 14 YEARS



This 90-kw. traveling bakeoven in the Portland, Ore., plant of the Grandma Cookie Company, Inc., has operated since 1924 at zero maintenance cost. The oven is 65 ft. 6 in. long, consisting of seven 8-ft. 6-in. sections with 2-ft. 4-in. extensions. It bakes 1,000 dozen cookies an hour—energy cost $1.

Rolling Mill Motors Kept Clean and Cool

It is usual practice in steel rolling mills to put important mill drive motors in a separate motor room to protect them against the effects of metal dust and fumes. At the new rolling mill * of the Bridgeport Brass Company Bridgeport, Conn., this was made unnecessary by inclosing important motors and motor-generator sets in housings through which cooled air under pressure was circulated from a common ventilating system. Air pressure within the motor housing prevents the infiltration of dust and fumes.

A separate ventilating system was provided for the motor-generator set and 1,000-hp. d.c. reversing motor associated with the hot and cold breakdown mills and also for the two 800-hp. d.c. motors driving the rolls of the four-high tandem cold rundown mill.

In addition to allowing cleaner operation this cooling system improved physical plant layout. In the case of the m.g. set and 1,000-hp. drive for the hot and cold mills, the special cooling allowed the machines to be located close together in a portion of the plant where ambient temperatures are high and production space valuable.

* On page 44 of this issue is a feature article on the electrical features of this mill.

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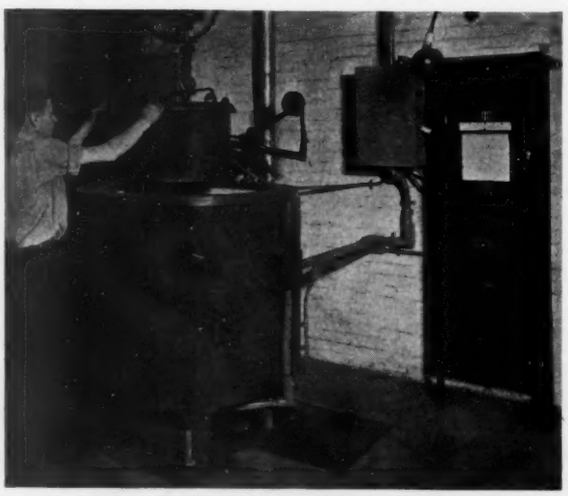
Half-Ton of Parts Uniformly Tempered

Uniform heating of closely packed machine parts is vital if tempering is to be uniform. Quality of the finished machine may suffer if temperature of the parts at the center of the batch varies widely from that of the parts on the outside. In 800 to 1,000 lb. batches of small typewriter parts at the Hartford, Conn., plant of the Royal Typewriter Company uniform temperatures ranging to 1,200 deg. F. are obtained throughout the 30- to 60-minute soak in a 20-kw. Homo air-drawing furnace, despite the high concentration of material.



Half-a-ton of typewriter parts are handled in 30 to 60 minutes in this drawing furnace

Substation Capacity

at $15.84 per kva

THE EXPERIENCE OF ONE POWER COMPANY WITH DISTRIBUTION CAPACITORS

The Problem

In 1936, an analysis of summer load curves by the Kansas City Power & Light Company showed new peaks on some of its substations because of refrigerator and air-conditioning load. Fully loaded or overloaded conditions resulted. The subtransmission cables to the substations were also involved. Inasmuch as the regulation and voltage conditions on the feeders were satisfactory, the problem became one of reducing the load on the substation and cable.

The Solution

There were several ways to meet the situation. After a careful study of all factors the engineers selected pole-mounted capacitor units, to be installed near the ends of the distribution feeders, as the most desirable and most economical solution. Such installations would reduce the substation load and reduce the feeder load and losses by improving power-factor on the feeders.

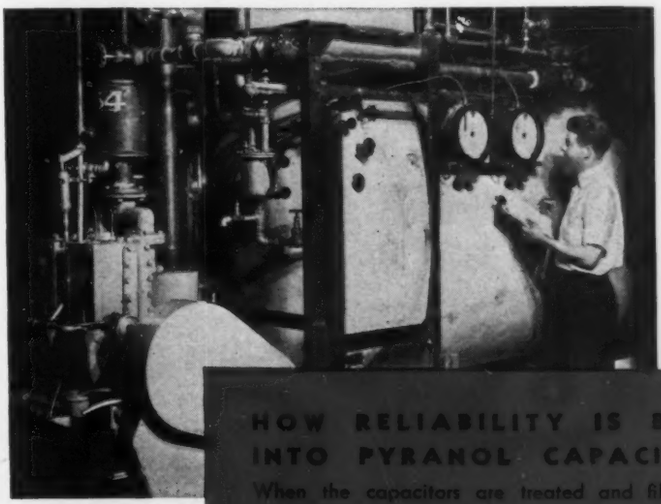
The Result

The most important substation involved was Substation R. On the lines from this substation 3060 kva of capacitors were installed at a cost of $9.32 per kva. As a result, 1800 kva of capacity was gained at a cost of $15.84 per kva. The performance of the capacitors in service has lived up to expected results in every respect.

Your Opportunity

Somewhere on your system—probably in a number of locations—lie opportunities for the profitable application of G-E Pyranol capacitors. It may be to gain added substation capacity at low cost or it may be to gain feeder capacity, reduce voltage drop, or reduce losses. In any case, it will pay you to investigate this economical, reliable means of gaining capacity. Ask your G-E representative about Pyranol capacitors or write for Bulletin GEA-2746. Address General Electric Co., Dept. 6-201, Schenectady, N. Y.

The G-E ten-million-volt lightning demonstration at the New York World's Fair, uses 102 Pyranol capacitors, each rated 100,000 volts.



THE OPERATING RECORD OVER 99.8% OF PYRANOL CAPACITORS

HOW RELIABILITY IS BUILT INTO PYRANOL CAPACITORS

When the capacitors are treated and filled with Pyranol, periodic readings of temperature and vacuum are taken during the entire time the units are in the treating tanks. McLeod gauges show the degree of vacuum in the tanks. Glass gauges enable the operator to check the filling process visually. This careful control of the treating process is one of the reasons for the remarkably good operating record of Pyranol capacitors.

GENERAL ELECTRIC

360-142

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Chart Determines Proper Pole Class

By BERTRAM E. ELLSWORTH
Electrical Engineer Iowa-Nebraska Light & Power Company, Lincoln, Neb.

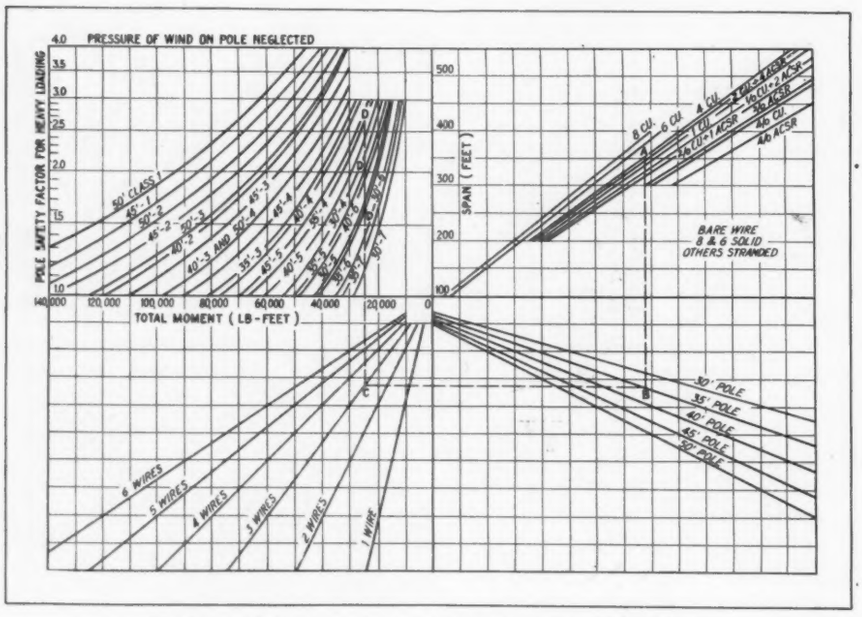
Seven variables determine pole size in overhead line design. These are span length, wire size, wire material, pole height, number of wires, class of pole and pole safety factor. The seven have been combined in conveniently usable arrangement in the accompanying chart. The use of the chart can be explained best by taking an example as, for instance, to determine the pole size for a three-phase line using No. 4 copper, 350-ft. spans and 35-ft. poles.

The starting point "A" is found where the No. 4 copper curve intersects the line for a 350-ft. span. A vertical line is drawn from "A" to "B," which is on the line corresponding to 35-ft. poles. A horizontal line from "B" intersects the curve for three wires at "C." Extending vertically from "C" locates three points "D" on various classes of 35-ft. poles.

The points "D" show that for a 35-ft. pole the safety factor of pole will be 1.6 for class 6, 2.0 for class 5 and 2.7 for class 4. The total moment load of the line is represented by the value 24,100 lb.-ft., which is the point where line C-D crosses the moment scale (for safety factor of 1.0). For a double-circuit line with 5 ft. (or less) between circuits, the moment for the lower circuit may be secured by using a pole 5 ft. (or less by interpolation) shorter. Add the moments for the two circuits and project vertically from the moment scale to find the pole size and safety factor. Loading curves may be drawn on the chart for conductors other than copper and A.C.S.R.

The above figures neglect wind pressure on the pole. This pressure may be calculated and added to the total moment before projecting vertically to determine the size of pole. The wind pressure on a pole loads it to from 2½ to 5½ per cent of its strength. An average value of 4 per cent can be used without a great deal of error. The pole strength is the value of total moment at the point where this moment line (safety factor of 1.0) is intersected by the line representing the pole.

In the above problem for a class 4 pole 4 per cent of 66,000 lb.-ft. is 2,600 lb.-ft. wind pressure on the pole. Adding 2,600 to 24,100 and projecting vertically from the 26,700 lb.-ft. point gives a safety factor of 2.5 instead of 2.7 for a class 4 pole with wind pressure on the pole.



Mechanical factors of line design determined by chart

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Proposes Low Voltage For Appliances

By MORTON G. LLOYD *
Principal Electrical Engineer
National Bureau of Standards
Washington, D. C.

Use of low voltages is proposed by the author as an alternative to grounding the non-current-carrying exposed metal parts of portable lamps and appliances used in conductive locations as recommended in the National Electrical Code (Article 250, Section 2518 c). Either method offers protection against shock due to defective insulation, but use of low-voltage with a step-down trans-

* From a paper presented before annual Safety Congress, Chicago.

Beating current crooks—worth to you—$5 and UP!

The fact stands that one out of six utility customers STEALS current by tampering.

We are so anxious to learn every new fact about current theft, that we will pay you $5.00 for every one you turn up—if unknown to us.

Murray Padlock Seals prevent concealment of meter tampering because utilities have found them completely tamper-proof. Nevertheless, in our efforts at constant improvement, we need theft facts. Five dollars to you, for every new one you turn up!

If you are an accredited utility meter superintendent, use the coupon to get a sample NEW Murray Seal and instructions for earning this easy, extra money. Metropolitan Device Corporation, 1250 Atlantic Avenue, Brooklyn, New York.

One out of Six
—a current crook

You'd be surprised at the number of checks already mailed to meter superintendents. We'd like to mail one—or several—to you!

MURRAY PADLOCK SEAL

Use the coupon!

Metropolitan Device Corp.
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Please send free material in accordance with last paragraph above.

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POSITION_____

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ADDRESS_____

former appears to be a more easily applicable and very satisfactory method of reducing the hazard to negligible proportions. It is entirely feasible for all portable appliances of low wattage and in addition is not subject to the unreliability of grounding.

The necessity for some precautions of this kind becomes particularly urgent under conditions of dampness, "conductive locations" or where the worker is likely to be in contact with grounded metal while using the portable appliance or lamp.

For this purpose the NEC recommends 32 volts, but some installations have used even lower voltages, and a lower voltage is recognized as standard in Europe. Thirty-two volts have been extensively used in this country for this purpose because it is a standard voltage for lamps. This particular type of lamp has been long used for railway work and for farm-lighting installations. Appliances for this voltage are usually somewhat special, although some have been put on the market for use with the farm lighting installations.

Consider some of the practices in this country:

A large electric manufacturing company has for some years made a practice of using 32-volt lamps with extension cords on such work as boilers, circuit breaker tanks, large welded inclosures, etc., where contact with grounded metal is practically inevitable. A 100-watt transformer is used to step down from 110 to 32 volts. In other shops of the same company 110-volt supply circuits are equipped with polarized receptacles which receive a plug having three prongs, one of which connects a grounding conductor.

In a Chicago packing house the boiler rooms and tank houses where any employee must enter a boiler shell have permanently installed circuits supplied at 32 volts from 150-watt transformers. In some of the other shops a transformer of the portable type is used to step voltage down to 32 volts before it is applied to appliances such as drills and saws. Appliances exceeding 750 watts are not used as portables, and the transformers vary in size from 200 to 750 watts.

Still another manufacturing plant has for many years been using six-volt portable lamps in wet places. These are operated from a low-weight storage battery that is sufficiently portable for the purpose.

Practice in Europe has developed along the line of using reduced voltages. In 1933 the International Union of Producers and Distributors of Electric Power adopted the definite standard of 24 volts for single-phase and 42 volts between phases if three-phase supply is used with a neutral point grounded. Prior to that date various values had been used in Europe. The values of 42 volts was chosen for three-phase supply for portables with the idea that the voltage to ground would be the same as the 24 volts specified for single-phase.

British Standards Institution has adopted standard specifications for the transformers used for this purpose having a rating of less than 1 kva. They may be fixed or portable, may have primary voltages not exceeding 600 and secondary not exceeding 55. They are required to have separate primary and secondary windings and the standard secondary voltages are 12, 25, 32 and 50. One point of the secondary winding must be brought out for grounding connection, and if the secondary voltage exceeds 25, the middle point of the winding must be brought out also.

•

Control Device for Field Relay Tests

By MERRICK R. FELDMANN
Relay Test Engineer
Jersey Central Power & Light Co.,
Asbury Park, N. J.

Difficulty is often encountered during tests on protective relays because the timer, no matter what type is used, does not stop definitely, but skips and coasts beyond the correct indication, due to momentary re-energizing of the timer coil by bouncing relay contacts or similar effects. An auxiliary sealing relay that picks up quickly when the relay being tested closes contacts and definitely stops the timer has been found to reduce timing errors.

A "test controller" for field relay testing has been built by the Jersey Central Power & Light Company to embody such a sealing relay and several other features. It consists of a main incoming power switch and double-pole fuse block mounted in a portable box. There is also a synchronous timer, and snap switches to turn the timer off and on and to throw in or shunt out series resistances which are needed when the controller is to be used on circuits of 200-240 volts. There are instrument-type fuses of low current capacity, selected of such rating that they will protect the coils of the timer from overheating if the selector switches should be thrown accidentally to the 100-120-volt position while the controller is connected to 240 volts.

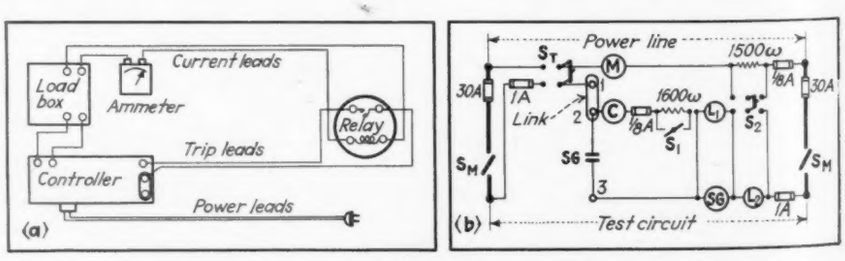
The wiring diagram of the device is shown. Two main conductors run directly through the box and include the large fuses and toggle switch. From the load side binding posts leads run externally to any type of current-regulating device desired, through the necessary instruments, and to the relay being tested.

Conductors branch off the main conductors to feed the synchronous timer, the motor coil of which is connected across the incoming power line ahead of the switch. A $\frac{1}{8}$-amp. fuse prevents damage to the motor from overvoltage. The clutch coil circuit of the timer is connected across the load side of the main switch so that the clutch coil is energized when test current starts. Three fuses are in the circuit to protect the coils from improper connections.

From binding posts 1, 2 and 3 leads run to the contact circuit of the relay under test. These binding posts are so connected that when 2 and 3 are connected together by the relay contacts the timer clutch coil and its series resistors are short-circuited, the coil is de-energized and the timer stops. Simultaneously an auxiliary relay closes contacts which maintain the short circuit of the clutch coil and seal its own coil in on full line voltage. When the main switch is thrown to "off" position the auxiliary relay is de-energized and the timer may be reset by means of its reset knob in the regular manner.

The link between terminals 1 and 2 allows relays which open contacts when they trip to be tested. The schematic layout of apparatus required to test a simple overload relay is shown. The controller is designed for single-phase work only.

Success of the clutch coil and sealing relay arrangement depends largely on the fact that a type C25 watt, 125-volt Mazda lamp is used in parallel with the relay. The lamp has low resistance when cold and takes very little voltage away from the clutch coil until it has had time to pick up.



Relay test controller corrects timing errors due to bouncing of contacts

(a) Field test controller set up with load box and ammeter to test overload relay. (b) Detailed wiring diagram of test controller. Symbols on drawing: S_M, main switch; M, timer motor coil; C, timer clutch coil; SG, timer sealing relay; S_1, timer switch; L_1, 25-watt, 120-volt lamp, type A-19; L_2, 30-watt, 120-volt lamp, type G-19; 1, 2, 3, terminals for trip leads. For circuit-closing relay connect to terminals 2 and 3. For circuit-opening relays remove link and connect to terminals 1 and 2. Switches S_1 and S_2 must be open if power supply is 240 volts and closed if it is 120 volts.

Building Up THE LOAD

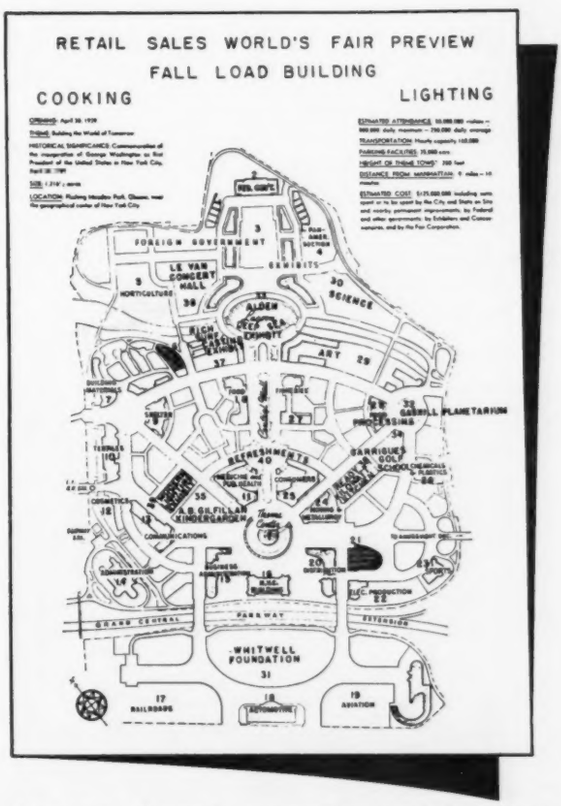
New ideas and practices in selling electrical equipment and service to commercial and domestic customers

World's Fair Sales Contests Under Way

The parade of salesmen's contests revolving around the World's Fair theme has already started, and one of the first is now in operation by Philadelphia Electric Company. This load building contest is not simply "hung on" the New York World's Fair. As a matter of fact, two Philadelphia Electric commercial salesmen will each win as a prize a "free full day at the fair, value $20. You may go any day you choose and on company time."

Salesmen's interest in the contest is stimulated by a twelve-page presentation, cover of which is reproduced below. This map of the fair grounds is localized by naming a concert hall after Philadelphia Electric's director of suburban retail sales, the surf-casting exhibit after the company's director of retail promotion, etc.

Seventy-five dollars of commercial cooking revenue and $75 of commercial lighting revenue is "railroad fare" from Broad Street to the World's Fair station and $25 of revenue in each classification is "admission fee to the fair grounds." Admission to each building is "paid" by securing 3 per cent of the salesman's quota for cooking and for lighting, and upon "entering" each of four out of 40 buildings en route bonuses are paid. Finally, when commercial cooking sales are made, a special prize of from 15 cents to $2.50 per kilowatt is paid for appliances ranging from electric coffee makers to electric bake ovens. These special prizes are paid only for the installation of co-operating manufacturers' new electric commercial cooking equipment.



Cover of salesman's presentation used for World's Fair load-building contest by Philadelphia Electric

Numbers on buildings represent sales goals and outstanding attractions are renamed for company officials.

Dealer Teamwork Hits High "One-Day Sale"

By O. P. B. JOHNSON
Residence Sales Manager Indiana & Michigan Electric Company, South Bend, Ind.

Electrical appliances totaling nearly $30,000 in sales volume and well over 400 in number and representing a utility E.A.R. to load building cost ratio of 7.37 to one were moved out of dealers' stores into the homes of customers in a recent "One-Day Sale" in South Bend. The time is significant because it was in the week before the national election, when most retailers are resigned to poor business. Also, that week was the end of the fall tax-paying period, when people are not generally in a buying mood.

The idea of the one-day sale was promoted by the Indiana & Michigan Electric Company, but credit for its success must be given to the dealers and to the wholesale distributors of appliances, whose mutual co-operation was wholehearted. Of the 37 appliance dealers in South Bend 26 enlisted in the project and expressions from the other eleven heard after the sale indicated they wished they had joined in also. Another

Items Moved in South Bend's "One-Day Sale"

1. Radios	90	11. Roasters	8
2. Washing machines	70	12. Waffle irons	7
3. Ranges	43	13. Flatirons	6
4. Refrigerators	39	14. Ironers	6
5. Vacuum cleaners	29	15. Water heaters	5
6. Lamps	22	16. Razors	5
7. Mixers	20	17. Heating pads	4
8. Toasters	18	18. Sewing machines	4
9. Coffee makers	13	19. Dishwashers	1
10. Clocks	10	Total items	400
Total sales volume			$25,047.74
Average sale			$62.62

factor most helpful in the sale was the way in which the two local newspapers saw an opportunity and made the most of it. Their advertising solicitors had something definite to sell to the electrical appliance dealers and they sold it to the tune of 1,600 total column inches of space. Also, the utility used 192 inches in general advertising of the bargains offered by dealers. In order to even up the difference between store and outside selling, a difference that would be especially marked in an activity of this kind, field salesmen were allowed to offer the special prices two days before and one day after the big day. Advantage of this was taken by twelve of the participating dealers.

•

Educate Public on Adequate Wiring

By HERBERT METZ
Chairman Plan Committee,
National Adequate Wiring Bureau

The Adequate Wiring Program, a year old, has made progress, satisfactory progress, but some industry thinking in regard to it and its objectives is not, even now, too clear. The most important factor in the program to many people is still "the other guy," although he remains, as he has always been, with us who are planning and programming, the man of the hour—Mr. John Q. Public.

Not so long ago, I was slated to talk to a group of utility folks. Before the meeting a well-known utility executive, talking to me about adequate wiring, said: "Your job is to educate the contractor. If the contractors know the importance of adequate wiring and sell it, the problem is solved."

Group education

"Well, now," I answered, "you're about one-eighth right and seven-eighths wrong. True, we must educate the contractor, but also must we educate the manufacturer, the wholesaler, and, if you will, the power people. That's a big job and an important one, but the real job is to educate Mr. and Mrs. John Q. Public to insist that the wiring be adequate in their new or old home.

"I grant you that the contractor is the contact point with the customer at the important time that customer is going to buy a wiring job. Now, let's assume the contractor, sold to the gills on adequate wiring, is trying to convince Mrs. Jones, who isn't sold t.t.g. on a.w., that she should have a few extra circuits, heavier wire and a flock of outlets. Mrs. Jones, however, wants an extra pink bathroom more than she wants a figure like Carole Lombard's, and she's got to cut the 'unessentials' to get it. Unless she's sold harder on adequate wiring than we have any right to expect, the contractor, who is in competition with other contractors, to sell her, she'll get the pink bathroom and a punk wiring job.

"Mr. and Mrs. John Q. Public—there's where the job of education starts, continues, and must never stop if we want this program to go across. We know, as you must, that the consumer must be sold on adequate wiring to the point where he or she will accept no substitutes before the program is a success. It can be done—but it is an industry problem, and as an industry problem it is being attacked. In the attack, every branch of the industry has a job to do all to the point that the public be educated."

Joint effort

The bureau, recognizing the importance of public education, has directed its publicity, advertising and promotional efforts in that direction and the utilities have an important part to play.

If every consumer knew just what adequate wiring would mean to him or her in the more abundant life that the more abundant use of electricity would make possible; if every consumer's home, in consequence, were adequately wired—the increase in domestic load would make the hump of the past ten years look like a pimple on an elephant. That's what the Adequate Wiring Bureau and its plan committee are aiming for, and that's why the utilities should be powerfully interested and powerfully active.

•

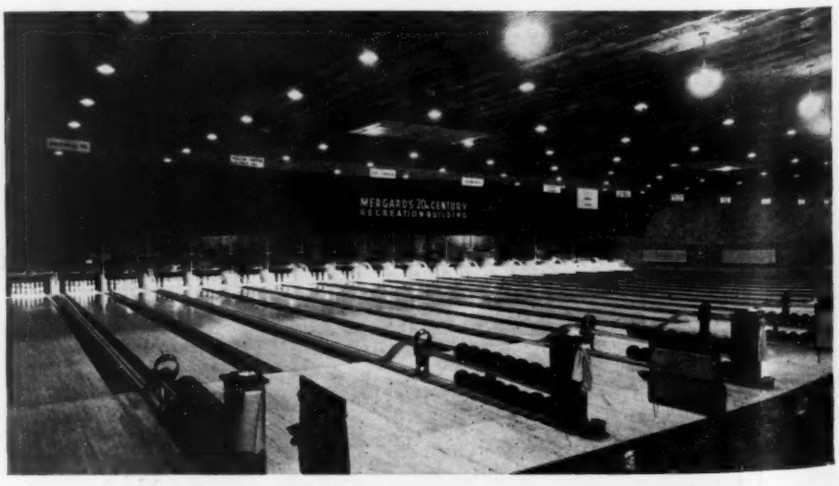
100 Ft.-Candles for Cincinnati Bowlers

By F. B. AUSDENMOORE
Lighting Division,
Cincinnati Gas & Electric Company

Visual and lighting authorities agree that good lighting improves seeing. Psychologists say brightness makes one more alert. These together may be responsible for better scores at Mergard's new Twentieth Century Recreation alleys than at their old location.

The new installation has 60 flush-mounted reflectors directing light on the alleys from 60 150-watt lamps. The resultant illumination from the foul line to the headpin measures 10 ft.-candles. The reflectors are so mounted that the bowler is not conscious of the light source, and hence concentrates on his objective, the tenpin. The intensity at this point is more than 100 ft.-candles. Above the approaches 300-watt lamps are used in inclosing glass units.

The alleys are very popular with bowlers and the management is convinced that illumination is one of the factors. Because of the demand air conditioning has been installed to permit bowling throughout the summer.



Resplendent in 100 ft.-candles are bowling alley pins in Cincinnati Gas & Electric territory

"I'm Sorry, Sir— but there are 1725 'Smiths', listed"

And yet, just *one* of them, to the man on the line, is *the* Mr. Smith. . . . Names, names, names of products, all clamoring to be remembered, recognized, and approved. Such approved recognition, however, does not come by wishing or yelling for it. It is bestowed, or denied, by those who use the product. . . . In the field of heating-element wire, the appliance industry gives this approval to "Chromel," whose performance over a stretch of thirty years has earned that award. Hoskins Manufacturing Company, Detroit, Michigan.

The Wire That Made *Electric Heat Possible*

CHROMEL *Wire*

A GOOD NAME IN HEATING ELEMENT

New EQUIPMENT AVAILABLE

Cable Fault Locater

Power cable faults are said to be located in minimum time with a new modification of the Murray loop circuit. Since it operates at high voltages, it eliminates the necessity for breaking down fault resistances, according to the company. A long spiral slide-wire makes for accuracy and speed in locating faults. In addition to its use for Murray loop tests, the assembly may be used for Wheatstone bridge measurements and for approximations of resistances by the voltmeter method. It was developed jointly by T. B. Morse of Commonwealth Edison Company and C. W. Newhall, Jr., of the Public Service Company of Northern Illinois. (See ELECTRICAL WORLD for August 27, 1938, page 40.)

Morse-Newhall test assembly; consists of universal loop unit, d.c. supply unit, insulating supports, operating rods and connecting leads. **Leeds & Northrup Co.**, Philadelphia, Pa.

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Fluorescent Fixture

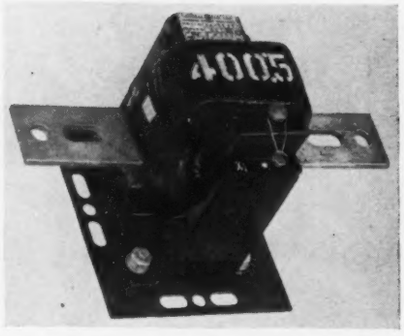
Fluorescent fixture; in two sizes, for the 18- and 36-in. lamps; finished in porcelain enamel, white inside. **Goodrich Electric Co.**, Chicago, Ill.

To provide local "daylight" illumination for such operations as inspection, drafting, color matching and similar applications, this company offers a new fluorescent fixture. Fixtures can be mounted singly or in parallel or linear rows.

•

Indoor Current Transformer

New indoor current transformer has been designed to combine the advantages of small size with high accuracy for metering on low-voltage circuits. Primary windings are said to be of sufficient size to permit continuous operation at 150 per cent of rate primary current. Primary terminal surfaces are silver-plated; secondary terminals are of the solderless type.



Type "JL-1" indoor current transformer, mounted; rated 600 volts and offered in three current ratings, 200/5, 400/5 and 600/5 amp. **General Electric Co.**, Schenectady, N. Y.

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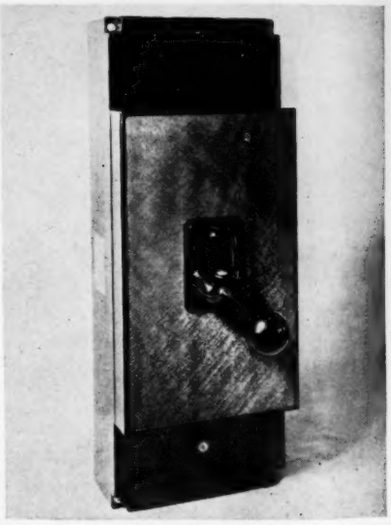
Electric Brakes

Torque motor-operated brake for a.c. service on elevators, cranes, hoists and similar applications has been designed for those installations where quick, "cushioned" braking is needed to stop or hold a load. The torque motor operates through a ball jack to release the brake. When the brake is fully released the motor is stalled across the line. When the circuit is opened the spring sets the brake. A slight flywheel action of the rotor provides the braking.

A.c. torque motor-operated brake; in five sizes, with maximum torque ratings of 160, 400, 800, 1,600 and 3,200 lb.-ft. on intermittent duty; all commercial frequencies and voltages. **Cutler-Hammer, Inc.**, Milwaukee, Wis.

Air Circuit Breakers

Designed for circuit protection of main distribution feeders in central stations, industrial plants or buildings where heavy concentration of power requires a breaker of 20,000-amp. interrupting capacity, new "De-ion" air circuit breakers have been announced. Instantaneous magnetic trips, operating at from nine to ten times thermal rating, supplement the thermal trip elements which are calibrated with inverse-time characteristics. Units are furnished with silver-alloy contacts.



Type "AB-20" air circuit breakers; offered in wire-size ratings from 70 to 600 amp. and for voltages to and including 600 a.c. or 250 d.c. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

•

Valve Positioner

Valve positioner. **Bristol Co.**, Waterbury, Conn.

To overcome the effect of friction in the valve stem and top of diaphragm control valves, this company has developed a new valve positioner. It is designed to give a proportionate valve stem travel for even the slightest change in the pressure of the air from the controller. The manufacturers suggest the pneumatic device for use especially on air-operated control installations where close control is of chief importance.

•

Tap Clamps

Recent additions to the line of tap clamps offered by this company are the "Perma-Grip" and the "Grip-Tite" clamps. The first of these features three-point contact with the conductor and is said to have

Out in the Mojave Desert, This Great American Chemical Plant Is Served by Exide Batteries

Principal job is control bus operation, but Exides are used also for telephone and other services as well

Exide
BATTERIES

LOCATED in the heart of the Mojave Desert is one of the most unusual bodies of water in the world — chemically-saturated Searles Lake.

On its shore is the fine, modern 20,000 h.p. plant of the American Potash and Chemical Corporation, which produces from the chemical-laden brine of the lake thousands of tons of potash, borax, soda ash and similar salts. The electric generators with a capacity of 16,000 kilowatts supply power not only to every department of the plant, but to the attractive community established by the company, where its employees and their families enjoy all the benefits of life in a modern city suburb.

Owing to the isolated location of its plant, the American Potash and Chemical Company has left no stone unturned to assure its unfailing operation. For that reason a 60-cell Exide battery with a capacity of 200 a.h., together with five Exides of smaller capacity, are used for control bus service, while a number of others are used for telephone communication, for car lighting on a company-owned railroad line, and for cranking a gasoline-powered railway car.

You'll find that many of the country's outstanding plants use Exide Batteries for control bus and other stationary services. Write us concerning *your* battery problems; we'll be glad to tell you definitely what these dependable batteries will do for you.

THE ELECTRIC STORAGE BATTERY COMPANY

The World's Largest Manufacturers of Storage Batteries for Every Purpose

PHILADELPHIA

Exide Batteries of Canada, Limited, Toronto

IT CAN'T HAPPEN HERE

(we hope)

Mexico's Kilowatt Crooks

Condensed from New York Herald Tribune

Henry J. Allen

Editor of the Topeka, Kansas, State Journal

A BIZARRE SPECIES of confiscation threatens the electric light and power companies of Mexico. The two companies that control practically all of the energy generated in Mexico — the Mexican Light & Power Co. of Toronto, Canada, and a Mexican subsidiary of American & Foreign Power Co. — are losing 25 percent of their output because of ingenious pilfering.

Company managers have discovered there are 140 ways of stealing electricity, but they cannot check the practice effectively because stealing current in Mexico isn't a crime. A civil action can be brought to collect for stolen current, but the courts are not responsive. It is foreign capital, so why worry?

Recently a new plant was built at a cost of $10,000,000 to produce 230,000,000 kilowatt hours for the growing business; before it was finished, increased stealing had absorbed the new capacity.

The simplest device for burglarizing current is within the reach of the humblest customer — a thin curved rod which detours the current around the meter. Experts in tampering with meters boldly canvass from house to house, selling this and more cunning tricks.

In many cases consumers get all the current they want by tapping street cables — without even being on the company's books. An entire new real estate addition provided current for its houses by cleverly tapping neighborhood wires. They were stealing current while applications were on the waiting list because the companies could not add to their load. A country club has done the same thing and refused to make amends.

In many parts of the country such thefts have cut off profits completely. The companies' labor costs, including social benefits, have gone up 55 percent during the last year. They haven't been allowed to increase their rates for 20 years. And if the plants are forced to suspend operations the government declares them bankrupt and takes them over.

There is little doubt that the persistent animosity of the government toward the plants expresses a definite plan to confiscate them — in line with the growing determination to confiscate all foreign-owned property. It gives added evidence of the irrepressible craze that is sweeping Mexico hell-bent for industrial and commercial chaos.

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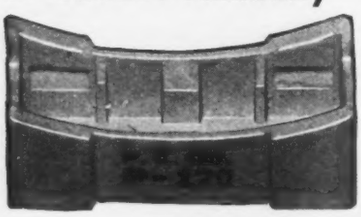
(N. Y. Herald Tribune, August 30, '38)

Reprint from Readers' Digest

STAR METER SEAL

and the Proper Laws Save Millions of Dollars Annually



Stop current diversion permanently, effectively and economically. To be removed, this porcelain cap must be mutilated or destroyed . . . a positive means for detecting the power thief. STAR METER SEAL fits all CS type meters.

SEND FOR SAMPLE AND PRICES

Address Metal Seal Dept.

★ THERMOLAIN
Rugged, Refractory Porcelain for Radiants, Ranges and Heaters

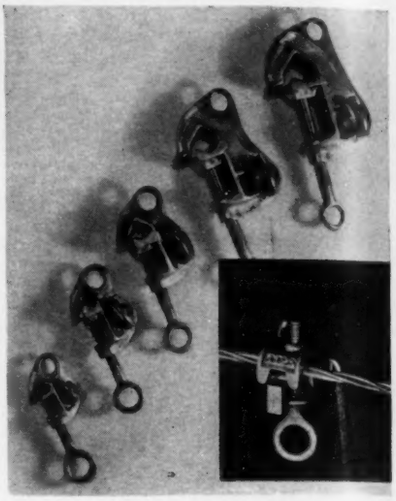
The STAR PORCELAIN COMPANY

★ LAVOLAIN INSULATING BEADS
13 Sizes

51 MUIRHEAD AVE., TRENTON, N. J.

MAKERS OF ELECTRICAL PORCELAIN SINCE 1899

an ultimate strength in excess of 260 to 500 in.-lb. (depending on size) applied torque on the eye screw. The second clamp is a parallel-groove type, designed for use in place of solderless connectors wherever it is necessary to connect or disconnect the line while it is energized. It is of the springless type, using a pressure screw and lock washer arrangement.



"Perma-Grip" and "Grip-Tite" (lower right) clamps; for use with or without armor; offered in various types and sizes. **Tips Tool Division, A. B. Chance Co.,** Centralia, Mo.

•

Industrial Drying Lamp

For industrial service where drying, baking and heating operations take place, this new unit applies the incandescent lamp to "radiant energy" drying. "Alzak" aluminum reflectors, in both concentrating and spread-beam types, are manufactured for use with the General Electric 250-watt CX drying bulb.

Radiant energy drying reflector equipment. **Edwin F. Guth Co.,** St. Louis, Mo.

•

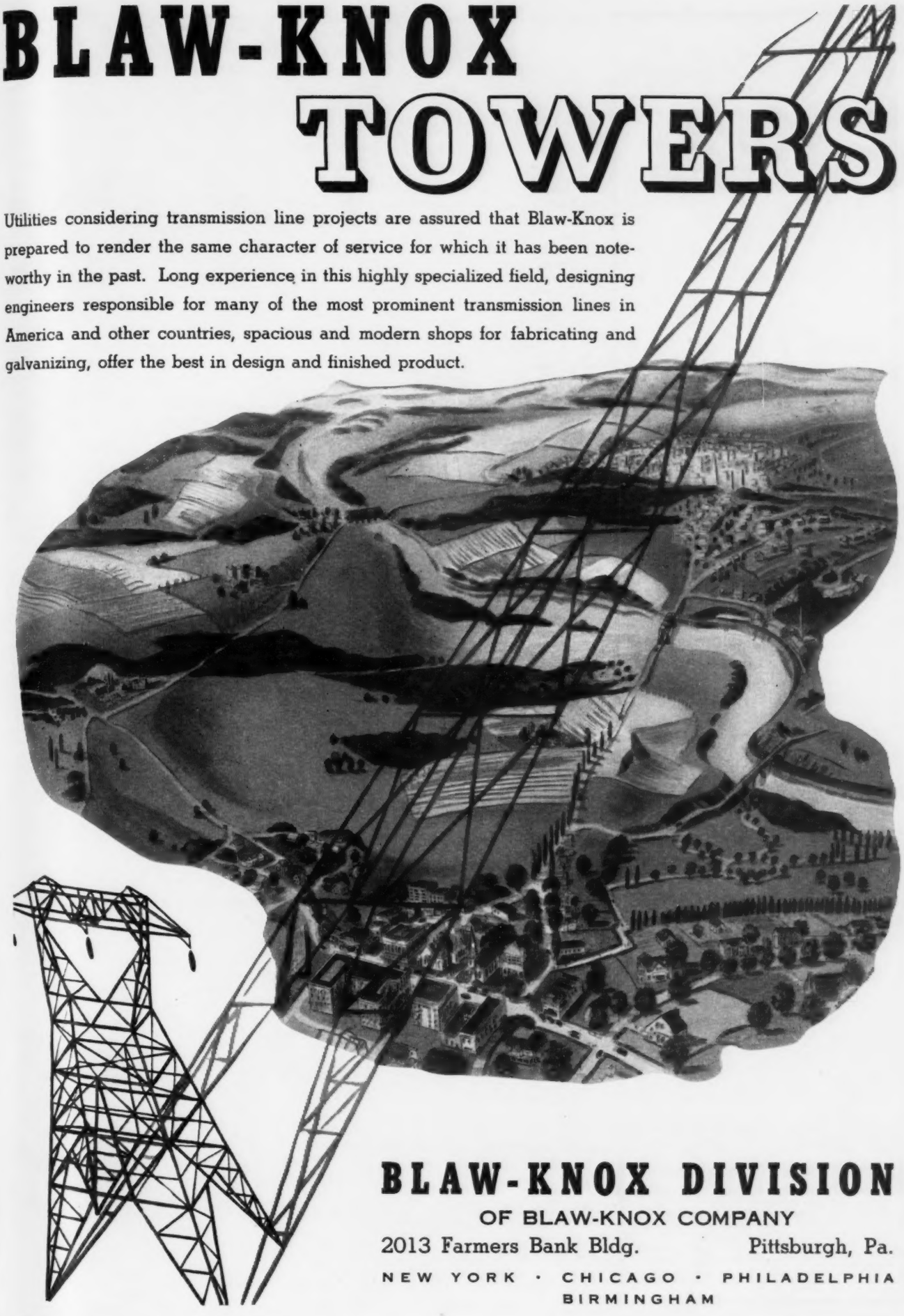
Construction Light

"Rex" emergency light. **Hunter Mfg. Corp.,** Bristol, Pa.

New emergency light, suggested for construction use by utilities, employs a simple valve mechanism which admits water gradually to the carbide, maintaining an internal working pressure said not to exceed five ounces. Since the gas is released at a constant rate, it is claimed that the light will burn for 2½ hours or more with a brilliance of 250 to 350 candle-power. An umbrella-like arrangement inside the container holds the carbide in place, to prevent its movement in

BLAW-KNOX TOWERS

Utilities considering transmission line projects are assured that Blaw-Knox is prepared to render the same character of service for which it has been noteworthy in the past. Long experience in this highly specialized field, designing engineers responsible for many of the most prominent transmission lines in America and other countries, spacious and modern shops for fabricating and galvanizing, offer the best in design and finished product.



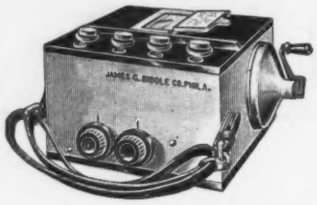
BLAW-KNOX DIVISION

OF BLAW-KNOX COMPANY

2013 Farmers Bank Bldg. Pittsburgh, Pa.

NEW YORK · CHICAGO · PHILADELPHIA
BIRMINGHAM

"MEGGER"



"Bridge-Meg" Resistance Tester—a complete resistance measuring outfit under one roof. Makes "Megger" tests of insulation resistance up to 109 or 200 megohms, also Wheatstone Bridge measurements of conductor resistance down to .01 ohm.

"WE DO NOT SEE HOW ANY PLANT MAINTENANCE DEPARTMENT CAN AFFORD TO BE WITHOUT ONE" — says the Electrical Engineer of a Paper Company.

TO THOSE who have "graduated" from trouble-*shooting* to trouble-*preventing*, the "Megger" test is the strong arm of the Electrical Department. It detects weaknesses in advance of trouble *without risk of injury to the apparatus under test.*

In plant after plant they will tell you—as they write to us—"invaluable in our maintenance work" . . . "scarcely a day goes by that we do not make some use of it" . . . "glad to recommend it to any one else" . . . "have been making periodic tests and have located insulation weaknesses" . . . "obtaining fine results" . . . "the 'Megger' pulled us out of our trouble nicely" . . . etc.

We invite you to write for our Catalog 1550-W, describing the various types and ratings of the "Megger" instruments

JAMES G. BIDDLE CO.

ELECTRICAL INSTRUMENTS

1211-13 ARCH STREET PHILADELPHIA, PA.

Other Biddle Specialties:

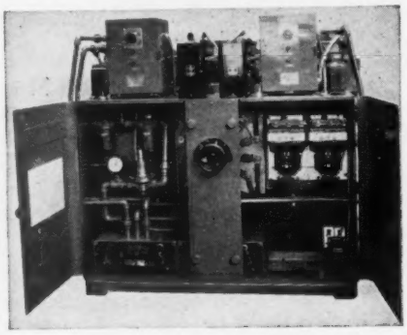
"Megger" Ground Testing Instruments
"Megger" Capacitance Meter
"Megger" Direct-Reading Ohmmeters
"Ducter" Low Resistance Testing Sets
"Dionic" Water Tester
"Frahm" Vibrating-Reed Tachometers and Frequency Meters
"Jagabi" Rheostats
"Jagabi" Speed-Measuring Instruments

the cylinder and protect against powdering. Placing the light in water and lighting the burner puts the light into operation.

•

Electric Metal Heaters

Two new electric metal heaters of the forging type are illustrated. Heaters are rated at about 50 kw. each and have photo-electric controllers over each electrode, which cut off the current when the metal has reached the predetermined temperature. The upper illustration shows a two-electrode special lever heater used in forging gear shift and brake treadles, while the lower illustration pictures a five-electrode forging heater used in heating cross bars for controlling "knee-action" springs.



"Berwick" electric metal heaters. **American Car & Foundry Co.**, New York, N. Y.

•

Lamp Guard

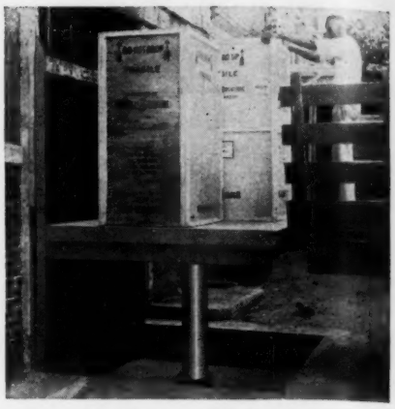
"Bunghole" guard; 35⅝ in. long, uses a 25-watt lamp. **McGill Mfg. Co.**, Valparaiso, Ind.

Although developed chiefly for inspection of the interiors of kegs or barrels, the shape of this lamp guard lends itself to use in similar small openings, such as pipes, tubes, machinery and crevices. Cage of the guard is of perforated steel tubing one inch in diameter, and there is a spear point at the end to remove any foreign matter found. The steel pipe handle has cord protector, strain relief and hook at the handle end.

•

Material Handling

For those plants wanting an elevating device with a comparatively short rise (travel of 30 ft. or less), for application in handling materials between floors, eliminating existing ramps between different



"Levelators" and "Tabelators"; showing the former unit in use by the General Electric Supply Co., Memphis, Tenn. Equipment offered by **Rotary Lift Co.**, Memphis, Tenn.

plant levels or loading into the back of trucks and freight cars, this company has announced a new line of equipment. Units with a travel of 5 feet or less form a part of the floor or loading platform when in their lowered position. Devices are of the oil hydraulic type, using an electric pumping mechanism, although air operation is also offered, and they can be controlled at the power unit.

•

Switchboard Wire

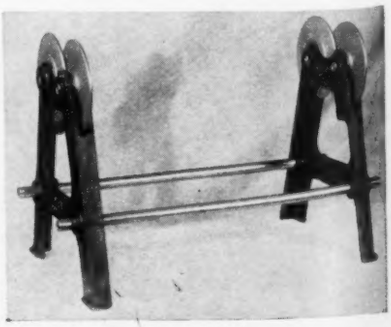
"Deltabeston" switchboard wire; stock sizes range from No. 16 to No. 8; for switchboard and panel wiring in 90 deg. C. continuous operation. **General Electric Co.**, Bridgeport, Conn.

New switchboard wire can be bent easily at sharp angles without rupture to the insulation, which is a synthetic compound said to be impervious to moisture, oil-proof and flame-retarding. Insulation is applied directly to tinned copper conductor, forming a seamless tube; asbestos is felted around the compound and a woven braid, impregnated with a flame-retarding compound, added. High dielectric strength of insulation is said to permit the wire being made with a smaller diameter without damage to electrical breakdown resistance or resistance to flame.

•

Armature Balancing Unit

New unit is offered for use in the static balancing of motor armatures. Free-turning semi-steel disks carry the armature; standards supporting the disks are adjustable to take any size armature within the limits of the machine.



Armature balancing ways; three standard models with swings of 10, 20 and 30 in., available in various shaft lengths. **Ideal Commutator Dresser Co.**, Sycamore, Ill.

....We are able to unload the poles much quicker and safer. My foreman reports that this method is by far the best method that he has encountered.

We would appreciate it very much if the remaining cars were braced with Acme Unit-Load Bands.

Yours truly,

Supt.

(A typical letter received by a leading pole shipper)

SAFER AND QUICKER POLE UNLOADING WITH THE ACME UNIT-LOAD METHOD

Approved by the Loading Rules Committee of the A. A. R., the Acme Unit-Load Method has also won the approval of pole receivers in all parts of the country. It provides greater safety and saves unloading time and money.

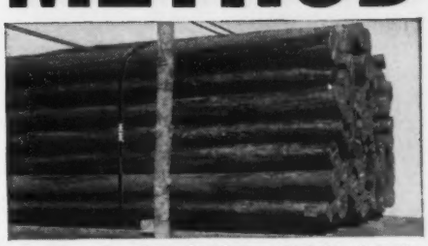
READ WHAT RECEIVERS SAY ABOUT IT

FROM A TELEPHONE COMPANY—"The poles came through in very fine shape, also the unloading was considerably facilitated by this method."

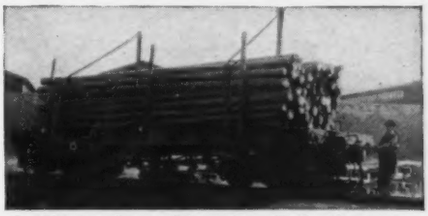
FROM A CONTRACTOR—"All the poles we get are braced in this manner now. We too feel that this is a big improvement over the conventional method of placing wire intertwined between each layer of poles, in that it eliminates many hazards of unloading."

FROM AN OHIO RECEIVER—"We were very much pleased with the method used in tying the poles on the two loads. Our foreman reports that it is considerably easier and safer to unload a car tied in this manner."

FROM A PUBLIC UTILITY COMPANY — "Cars are much easier unloaded, and also safer on account of this banding."



1. *View of car braced with Acme Unit-Load Bands.*

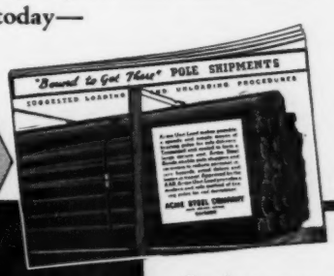


2. *Showing how safely and easily bands are removed from side opposite unloading side.*

3. *Tension is gradually eased and poles roll safely off the car.*

The Acme Unit-Load Method is simple and easy to apply. The flat Acme Bands tensioned and sealed around the load and across the stakes assure *safe* delivery—eliminate delay and loss in transit. Suggested procedures are contained in the illustrated booklet "Pole Shipments and Unloading Procedures." Everyone concerned with the handling of poles and other lumber products should have a copy—write for yours today—there is no obligation.

WRITE FOR THIS FREE BOOKLET!



ACME STEEL COMPANY
2845 ARCHER AVENUE
CHICAGO, ILL.
Branches and Sales Offices in Principal Cities

Acme Steel Company
2845 Archer Ave., Chicago, Ill.

Send me a copy of the new booklet about POLE SHIPMENTS with suggested *safe* Unloading Procedures.

Name .....

Address .....

City ..... *State* .....

Manufacturing AND MARKETS

Refrigerator Sales Decline in December

Sales of household refrigerators by manufacturers to distributors and dealers dropped sharply in December, 1938, in comparison with the similar month of 1937, according to the report issued by the National Electrical Manufacturers Association. Domestic sales totaled 44,410, compared with 101,881 in December, 1937; for the twelve months period ended December sales totaled 1,191,627, compared to 2,203,335 for the year 1937.

World sales in December, 1938, amounted to 54,363 units, as compared with 113,132 in December, 1937. For the entire year 1938, world sales totaled 1,358,956, compared with 2,394,659 for the year 1937.

It is estimated that the figures on electric household refrigerators reported to the National Electrical Manufacturers Association include more than 90 per cent of the industry.

•

Porcelain Insulator Starts New Construction Program

Porcelain Insulator Corp., Lima, N. Y., has started work on its two new buildings, as well as the installation of the latest type tunnel kiln. The construction program also includes a rearrangement and expansion of the design test laboratory including additions to the radio interference testing equipment. The new program will result in about 22,000 sq.ft. of added factory capacity part of which will be used for a needed expansion in the switch insulators and bushing assembly department.

•

Electrical Exports Off 9%, Refrigerators 15, in 1938

Exports of electrical machinery and apparatus during 1938 totaled $102,151,000, as against $112,576,000 in 1937, according to the Department of Commerce. During December such exports were $9,877,000, compared with $7,948,000 in November and $9,776,000 in December, 1937.

Exports of household refrigerators last year numbered 141,012, valued at $10,766,000, against 167,862 units valued at $12,755,000 in 1937. For December these exports were 8,210 units valued at $632,000, compared with 8,235 units valued at $699,000 in November and 9,327 units valued at $786,000 in December, 1937. For an analysis of the electrical manufacturing industry in 1938, see ELECTRICAL WORLD, January 14, 1939, page 96.

•

Census Shows Gains for Manufacturing

Electrical machinery, apparatus and supplies manufactured in 1937 had a total value of $1,622,098,291, a gain of 68.9 per cent over $960,430,400, the reported value for 1935, according to preliminary figures from the recent biennial Census of Manufactures.

Summary statistics for 1937, 1935 and 1933 are given in an accompanying table. This industry, for census purposes, includes establishments engaged primarily in the manufacture of equipment for employment directly in the generation, storage, transmission or utilization of electric energy.

Westinghouse Orders Total $149,662,776

Orders booked by Westinghouse Electric & Manufacturing Co. for 1938 totaled $149,662,776, as against $229,540,061 in the preceding year, a decrease of 35 per cent.

Sales billed totaled $157,953,216, against $206,348,307 in 1937, a drop of 23 per cent.

Unfilled orders at the end of 1938 amounted to $40,188,150, as compared with $60,298,087 at the end of 1937, a decrease of 33 per cent.

Net income for the year totaled $9,052,773, as against $20,126,408, a decrease of 55 per cent.

A. W. Robertson, chairman, stated that the downward trend in 1938 had been checked during the middle of the year, but showed no signs of improvement until the end of the year. "There has been a definite improvement in January," he declared.

Directors at a meeting last week declared a dividend of 50 cents a share on the common and 87½ cents a share on the preferred stocks, payable February 28 to stockholders of Feb. 14.

The company declared a 5 per cent profit-sharing bonus for its workers for January, compared with a bonus of 4 per cent in December and 3 per cent in November.

Summary for the Electrical Machinery Industry, 1937, 1935, 1933

(Because they account for a negligible portion of the national output, plants with annual production valued at less than $5,000 have been excluded since 1919)

	1937	1935	1933	Per Cent of Increase	
				1935–1937	1933–1937
Number of establishments	1,435	1,393	1,209	3.0	18.7
Wage earners (average for the year)[1]	257,660	179,641	130,857	43.4	96.9
Wages[2]	$355,958,610	$198,046,269	$115,749,609	79.7	207.5
Cost of materials, supplies, fuel, and purchased electric energy[3]	[3] $642,866,693	$370,903,958	$212,513,709	73.3	202.5
Value of products[2]	$1,622,098,291	$960,430,400	$553,431,450	68.9	193.1
Value added by manufacture[4]	[3] $979,231,598	$589,526,442	$340,917,741	66.1	187.2

[1] Not including salaried officers and employees. Data for such officers and employees will be included in a later report.

[2] Profits or losses cannot be calculated from the Census figures because no data are collected for certain expense items, such as interest, rent, depreciation, taxes, insurance and advertising.

[3] The figures for "Cost of Materials," etc., and for "Value added by manufacture" for 1937 are not strictly comparable with the corresponding items for 1935 and 1933.

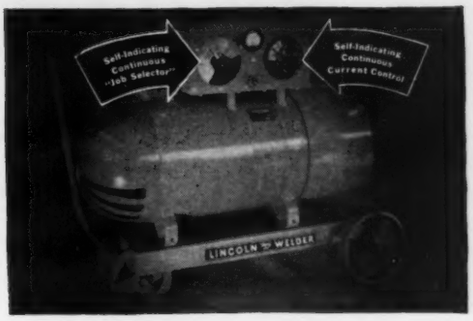
[4] Value of products, less cost of materials, supplies, fuel and purchased electric energy.

PLUGGING FOR PROGRESS WITH POP AND LAD

BIG GAME THAT'S ALWAYS IN SEASON

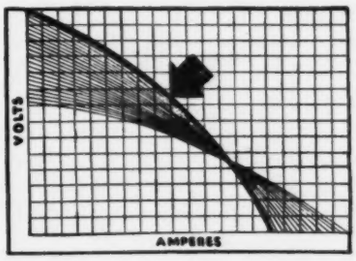
How to bag it with the New "Shield-Arc"

TYPICAL HUNTING GROUND
Flat, downhand welding of machine bases with 3/8-inch electrode.



THE WEAPON. New *"Shield-Arc"* with Self-Indicating "Job Selector" and Current Control.

READY. Self-Indicating "Job Selector" sets "sights" of *"Shield-Arc"* Welder for accurately aimed volt-ampere curve.



AIM. At this setting, volt-ampere curve has steep slope. Hence, changes in arc length have little effect on welding current, assuring steady arc heat at high deposit rates.

FIRE! Molten metal flows at maximum speed and with minimum spatter because arc is high-powered, yet steady. Result: Lowest cost-per-pound-deposited is *in the bag.*

"I know a user of this new Lincoln who was able to boost his electrode calibre from 5/16" to 3/8" and . . . wham! . . . cost-per-pound-deposited dropped from 75c to 55c. At 5 lbs. per hour, that's a buck bagged every hour throughout a perpetual season!"

"Right, Pop. This 'Shield-Arc' is the answer to many profit-hunters' prayers because it provides *any* TYPE of arc and *any* AMPERAGE—each one labeled. Your hunting domain is bigger and richer. Shoot the coupon for your free guide."

Largest Manufacturers of Arc Welding Equipment in the World

THE LINCOLN ELECTRIC COMPANY

CLEVELAND, OHIO

THE LINCOLN ELECTRIC CO., Dept. U-567, Cleveland, O.
Send free copy of Bulletin 412-A.

Name _____ Position _____

Company _____

Address _____

City _____ State _____

ADEQUATE WIRING SERVES AND SAVES

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Re-wiring for the last time

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Wiremold carries current to work

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We'll give you a brand new slant on ADEQUATE WIRING

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- COMMERCIAL
- INDUSTRIAL

Wiremold Systems and Wiremold Engineering give you a direct, economical answer to the great majority of pre-wiring and re-wiring problems in domestic, commercial and industrial installation.

But the Wiremold idea goes a great deal further than this. By constant introduction of new developments and extension of usefulness it helps you to REACH out for new business... to provide new convenience and higher standards of service to your customers. Witness the Wiremold perfected LUMILINE Lighting Strip System, the Wiremold FLUORESCENT Lighting Strip System, Wiremold CONTINUOUS OUTLET Systems for home or commercial use.

Get to know Wiremold and the real cooperation Wiremold Engineers can give you. Many utilities make Wiremold basic wiring plans and data sheets an integral part of adequate wiring promotion.

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HARTFORD, CONN.

SOUND PLANNING . . .
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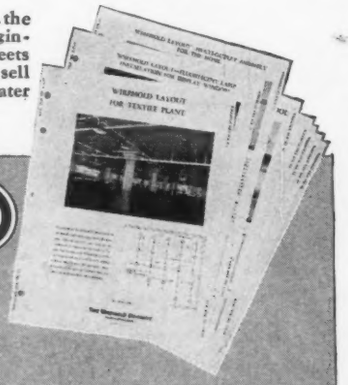
SOUND SELLING

Yours for the asking... the help of Wiremold Engineers... detailed data sheets and plans to help you sell adequate wiring... greater load.



WIREMOLD Your LOAD BUILDER

Manufacturers Make Sales Assignments

Manufacturing companies have recently announced the following appointments to their sales staffs:

Revere Copper & Brass Incorporated has made Keith C. Bowers, formerly of the St. Louis office, its sales representative in western Missouri and Kansas with headquarters in Kansas City, Mo.

Porcelain Products, Inc., has appointed the following sales representatives: E. F. Baesel, Charlotte, N. C.; Bowditch & Co., Knoxville, Tenn.; H. W. Crowe, Jr., Atlanta, Ga.; F. B. Jackson, Dallas, Tex., G. L. Marchesseau, Jackson, Miss.; C. E. Moore, Jr., Washington, D. C.; F. P. Oliver, Chicago, Ill.; M. J. Pagel, Chicago, Ill.; J. W. Taulman, Jr., Dallas Tex.; J. W. Watkins, Seattle, Wash.; J. Q. Lalor, Denver, Colo. J. E. Holman is assistant sales manager with headquarters in Parkersburg, W. Va.

Osmose Wood Preserving Co. has appointed Haworth L. Brueck Co., Chicago, as midwestern sales representative for the company on electric light and power company accounts.

•

Copperweld Splits Shares

Stockholders of the Copperweld Steel Co. at a recent meeting in Pittsburgh approved a two-for-one split-up in outstanding shares, from 300,000 of $10 par value into 600,000 of $5 par value. The directors declared a dividend of 40 cents a share applying on the old stock, but if conversion of shares is completed by March 1 the company will distribute 20 cents a share on the new stock. Last year the company paid 50 cents a share on March 10 and 30 cents each on June, September and December 10.

•

City Plant Lets Contracts

Mount Pleasant, Iowa, has recently awarded several contracts on improvements at the municipal light and power plant. Among the contracts for electrical equipment were the following: Turbo-generator to Worthington Pump, $42,500; condenser to Allis-Chalmers, $19,786; switchgear to Westinghouse Electric & Manufacturing Co., $11,725; wiring and other electric equipment to Carstens Bros., Ackley, Iowa, $5,408.

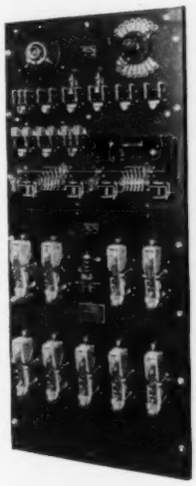
New York Metal Prices

	Feb. 7, 1939 Cents per Pound	Feb. 1, 1939 Cents per Pound
Copper electrolytic	11.25*	11.25*
Lead Am. S. & R. price	4.85	4.85
Antimony	11.25	11.25
Nickel ingot	35.00	35.00
Zinc spot	4.89	4.89
Tin straits	45.95	46.40
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

Perfect CONTROL!

Photo by U. S. Army Air Corps



AUTOMATIC ELECTRIC MOTOR CONTROL

Monitor builds standard controllers, starters, and accessories, also custom-built apparatus for any electric motor control problem, no matter how complex. Monitor sales engineers in principal cities will gladly consult with you. Write us.

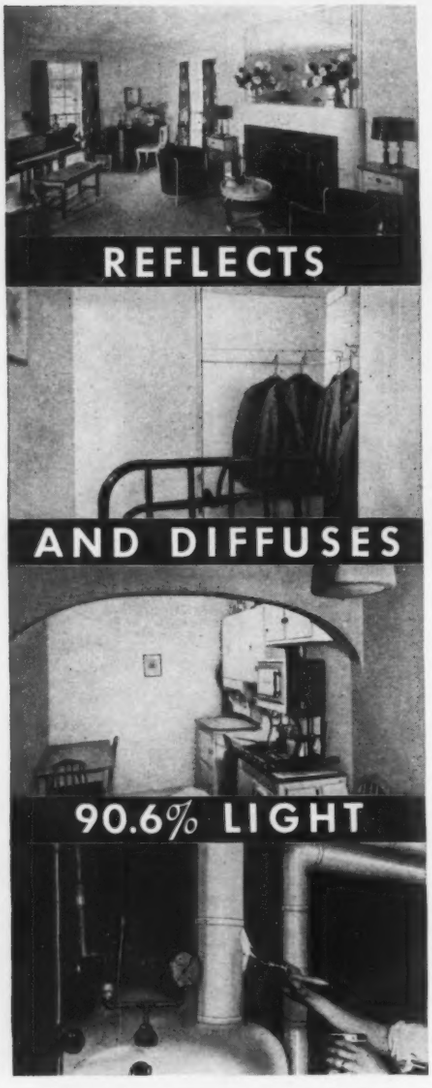
THESE crack pursuit pilots have what it takes to maintain position in difficult formation. But under their expert hands (and feet) is an extremely sensitive system of *controls* for speed, direction, altitude and attitude that permits precise manoeuvering.

Monitor makes none of these, but in its own field of automatic control for electrically-operated equipment it occupies a "top flight" position with most designers and engineers. A long and varied experience plus standardized designs adaptable to many requirements enable us quickly and economically to solve problems of control for any type of equipment. A survey by Monitor Engineers involves no obligation whatever. Write us today.

MonitorControllerCompany

GAY, LOMBARD & FREDERICK STS. **BALTIMORE, MARYLAND**

LUMINALL
for All Interiors



—and light reflection values for some of the Luminall colors are correspondingly high.

In your work you'll find many places where this paint will serve your patron's interests.

We have prepared a booklet "Painting for Light & Decoration" that tells all the details of this fine paint. Send for it.

NATIONAL CHEMICAL & MFG. CO.
3617 South May St., Chicago
25 Forrest St., Brooklyn, N. Y.
In Canada: Standard Paint & Varnish Co., Ltd., Windsor, Ont.

Send for free Booklet

National Chemical & Mfg. Co.
3617 South May St., Chicago
Send booklet—"Painting for Light & Decoration".

Name & Title .....
Firm Name .....
Address .....

Field Reports on Business

Major attention of the electrical industry was directed this week to the settlement of the TVA competition question. It is expected that the move will open the way for large-scale utility construction. The move is considered a definite step by the government toward co-operation with business.

NEW YORK

Electrical manufacturers are looking forward to a sizable increase in utility equipment orders following the settlement of the TVA competition problem. The optimistic feeling prevailing this week has overshadowed the letdown in business last week due to bad weather conditions and the "waiting" policy, which was becoming pronounced.

It is generally expected that, with the TVA question settled, the government will display more definite signs of a friendly policy toward business. A return of investor confidence in utility securities was seen in the splendid reception of the $104,000,000 of North American securities last week and the sharp runup in utility securities this week. Many reached new highs for the year.

The chances appear bright that a large amount of utility refunding will be undertaken in the near future—some necessitated by integration plans. It is likely that once refunding is out of the way attenion will be directed to the raising of new capital through equity financing. While this step is some distance in the future thought is being given to the subject.

Many believe that government spending this year will be in the direction to encourage private construction. In this way employment is expected to increase sharply and lead to better business in all lines.

NEW ENGLAND

Industrial switch and control equipment business aggregating over $200,000 is receiving attention by manufacturers in this district. Recent orders of unusual interest include a new 4-cycle, uniflow type engine and a 400-kw. generator which will be installed in the Massachusetts State House, Boston, at a cost of $49,200; between $12,000 and $15,000 worth of industrial electric furnace equipment was sold during the past fortnight and inquiries for additional furnaces for metal treating are reported in encouraging volume.

Small motor sales are advancing and, according to one representative, are ahead of January, 1938; orders from machine tool manufacturers are being booked in good number; one order noted consisted of three 15-hp. motors and five others ranging from 1 hp. to 10 hp.; a group of more than 250 fractional-horsepower motors was sold during the past month. Small switch and control buying is vigorous, reports one distributor.

A new electric air drawing furnace has been added to the Pratt & Whitney division of Niles-Bement-Pond Co., Hartford. The Boston Public Library has contracted for full steam and electric service on a three-year trial basis from Boston Edison Company at the Copley Square building. Three steam-generating sets totaling 240 kw. will be removed.

Public Service of New Hampshire recently sold 150 40-gal. electric water coolers during a special campaign; Vermont districts purchased 36 refrigerators and 23 ranges.

PACIFIC COAST

January business was disappointing, though slightly better in volume than last January and 1938 reductions in personnel and stocks leave some profit as compared with a year ago. Some slight price increases in key wiring devices, following several years of reductions have stimulated stock orders. February will evidently be another month of heavy machinery bidding for government projects, the largest item covering four 103,000 hp. turbines and governors for Coram Plant of Central Valley California project, while Bonneville, Oregon, is in the market for 4,000- and 25,000-kva. transformers and Kendrick, Wyo., for 1,667- and 2,000-kva. transformers, a 5,000-kva. condenser, and 115,000-volt disconnect switches and lightning arresters. Gradually superseding these machinery purchases as outstanding branch of activity are large additions to Pacific army and navy establishments.

These widespread service plants not only provide a backlog of business for coast wholesalers and contractors, but also stimulate much private building in adjacent interior cities, Sacramento and its naval air station handling $20,000,000 of supplies a year being an example. Power companies predict a good year for sale and installation of pumping plants, with their complementary transformers, meters and substation material. Manufacturers of such equipment expect a good year because of light rainfall, but most all other industrials are buying only on dire necessity.

CHICAGO

The severe blizzard which swept through this territory last week virtually paralyzed business activity for two days. Retail trade was brought nearly to a standstill, while manufacturing plants suffered greatly from lack of man-power to maintain operations. Returning quickly to normal, however, finds business, in general, following a slowly rising trend.

Industrial activity ranged about 20 per cent above a year ago and signs of moderate expansion of inventories are in evidence. Steel production suffered a slight contraction, but electrical power output forged ahead again, to stand 10 per cent higher than a year ago. Electrical manufacturers report an increase in orders for central station equipment. Additional inquiries are cause for considerable optimism over the immediate outlook.

Electric range sales continue to gain, one order being for the installation of 65 ranges which will mean an increased load of 575 kw. Commercial and industrial lighting equipment sales continue to show steady improvement. Reports indicate an increased demand for small motors, control apparatus and transformers.

The outlook for building construction is the most favorable in years. Additional REA allotments recently made total $1,300,000 for 1,238 miles of line construction in Illinois. Twelve 150-kw. and two 37-kw. transformers were installed to provide power and light for subway construction work.

FOR ACCURATE AND EFFICIENT testing of service meters

NEW

SANGAMO

TYPE J-33 PORTABLE TEST METER

Providing the most modern design details, including minimum size and light weight, the new Sangamo Type J-33 Portable Test Meter is especially adapted to the accurate and efficient testing of watthour meters of the capacities usually employed in residential service. Designed with separate terminals for each of its three current coils, Type J-33 is in keeping with the high standard set by other Sangamo Type J Portable Test Meters.

Separate current terminals are used for each of three current ranges—1, 5, and 15 amperes.

SANGAMO

TYPE J-5 AND J-3 METERS

In both the J-5 and J-3 meters a selector switch is used for current coil selection. Type J-5 has five current coils rated at 1, 5, 10, 25, and 50 amperes; Type J-3 has three current coils rated at 1, 5, and 25 amperes. Silver contacts are used on current and potential switches. Because of their straight-line accuracy and ample current-carrying capacity for twice the rated load, Sangamo Portable Test Meters assure superior accuracy.

Selector switches of the J-5 and J-3 meters facilitate switching to any desired current coil.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

News ABOUT PEOPLE

C. A. Eastman Assigned New Duties; Fite Succeeds Him

C. A. Eastman, recently appointed assistant operating sponsor with Ebasco Services, Inc., in charge of rendering service to the Carolina Power & Light Co. and Florida Power & Light Co., has been connected with the Electric Bond & Share System since 1929, when he was put in charge of industrial sales in the general office of the Pennsylvania Power & Light Co., Allentown. In 1933 he joined the staff of Electric Bond & Share Co. as industrial sales consultant and in 1937 became head of the sales department of Ebasco Services.

A native of Omaha, Neb., Mr. Eastman attended the University of Nebraska for one year and Harvard University for three years, graduating in 1923. He spent a year in the Harvard Business School and then served the Phelps-Dodge Corp. as a mining engineer at Bisbee, Ariz., for two years. Subsequently he became affiliated with the Bethlehem Mines Corp.

Mr. Eastman is chairman of the National Better Light-Better Sight Bureau; chairman of the sales training committee of the Edison Electric Institute, a member of the Institute's sales committee, and a member of the executive committee of the National Modern Kitchen Bureau.

C. A. Eastman

R. H. Fite, Jr.

Robert H. Fite, Jr., who succeeds Mr. Eastman as head of Ebasco sales department, was graduated from Vanderbilt University in 1923 and immediately thereafter entered the testing department of General Electric. In 1925 he joined the Florida Power & Light Co. and in 1936 became affiliated with Ebasco Services, Inc.

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▶ WILLIAM M. FLETCHER has succeeded Thomas W. Ozlin as chairman of the Virginia Corporation Commission.

▶ A. EMORY WISHON, president San Joaquin Light & Power Corp., has been awarded the Albert Graves Wishon Distinguished Service Medal "in recognition of his unselfish devotion to the company, its employees, customers, communities and the industry." The medal was established in 1929 in honor of the late A. G. Wishon, founder of San Joaquin Light & Power Corp.

▶ MORRIS D. HOOVEN has been appointed assistant transmission and substation engineer, electric department, of the Public Service Electric & Gas Co., Newark, N. J. Mr. Hooven was formerly engineer—transmission. He has been associated with the company since 1922. He is a member of the A.I.E.E. and has been active in committee work for the E.E.I.

Dr. Lewis Named to Direct Cornell Engineering School

William A. Lewis, Jr., engineer with the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., and a Westinghouse lecturer in electrical engineering at the University of Pittsburgh, has been appointed director of the school of electrical engineering in the college of engineering, Cornell University. He entered office on February 1. Dr. Lewis was graduated from the California Institute of Technology in 1926. While an undergraduate, he was employed during summer vacations by Westinghouse in Los Angeles. Entering the central station department in East Pittsburgh in 1929, he rapidly became an authority on technical electrical problems, particularly those concerned with interconnection and high-voltage transmission.

One of his major interests has been planning networks for power distribution in large areas so set up that failure at any point will be immediately and automatically compensated. Acting for his company, he has been consultant for public utilities instituting such networks on the Pacific Coast, in New England and in the Pittsburgh area.

In 1928–29 Professor Lewis directed the electrical engineering senior laboratory at the California Institute of Technology. He originated an evening course for Duquesne Light Co. engineers in

1930–31, gave it to engineers of West Penn Power Co. and conducted courses as part of the Westinghouse-University of Pittsburgh co-operative program. He has invented speed relays for power system protection and is co-author of a book on symmetrical components.

▶ LADNER V. ROSS, illumination engineer for the Washington Water Power Co., has been placed in charge of illumination for the Washington state exhibits at the San Francisco and New York fairs.

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Jones and Hageman Named Design Engineers by TVA

Barton M. Jones has been appointed consulting design engineer of the Tennessee Valley Authority and Harry A. Hageman has been named chief design engineer. As consulting design engineer, Mr. Jones will review both the general design and special features of the various projects and will study the performance of equipment to aid in improving future design. Mr. Hageman will be responsible for the preparation of designs and specifications for all dams, reservoirs, locks, power house and appurtenant structures.

Mr. Jones has engaged in design and construction work on a number of projects in Arizona, New Mexico, Colorado, Ohio and Pennsylvania. He was construction engineer during the building of Norris Dam, and during the past year and a half has served as acting chief design engineer.

Mr. Hageman's experience includes connection with a large number of hydro-electric projects. He was chief hydraulic engineer for the Stone & Webster Engineering Corp. for more than twelve years. Since joining TVA he has served as chief hydraulic engineer.

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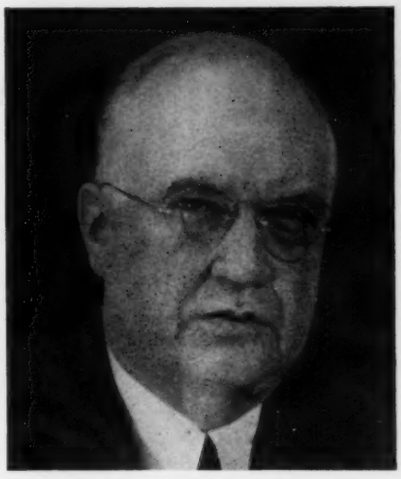
▶ GEORGE B. FOSTER, assistant to Vice-President John F. Gilchrist, Commonwealth Edison Co., Chicago, retired from active duty after completing more than half a century of service to the electrical industry. Mr. Foster entered the employ of the Chicago Edison Co. in 1887 as an assistant in the chemical meter laboratory, but left after a few years and subsequently worked in other branches of the industry. He was in charge of the arc lighting of the Columbian Exposition in 1893 and at the turn of the century was directing operations of the Gunther Electric Co., which supplied a section of downtown Chicago with electric service. When this organization was absorbed by the Commonwealth Edison Co. in 1908 he became assistant to Mr. Gilchrist, who was then assistant to the president.

E. Frank Gardiner Resigns from Commonwealth Edison

E. Frank Gardiner has resigned as advertising manager of the Commonwealth Edison Co., Chicago. Mr. Gardiner has been in public utility advertising work for 18 years. Before going to the Edison company he was in charge of publicity and advertising for



the Midland United Company and its subsidiaries operating in Indiana and Ohio.

Mr. Gardiner served two years as president of the Public Utilities Advertising Association and also served two years as chairman of the publicity and advertising section of the American Gas Association. Prior to entering the public utility business, Mr. Gardiner was for more than 12 years on the editorial staffs of Chicago daily newspapers.

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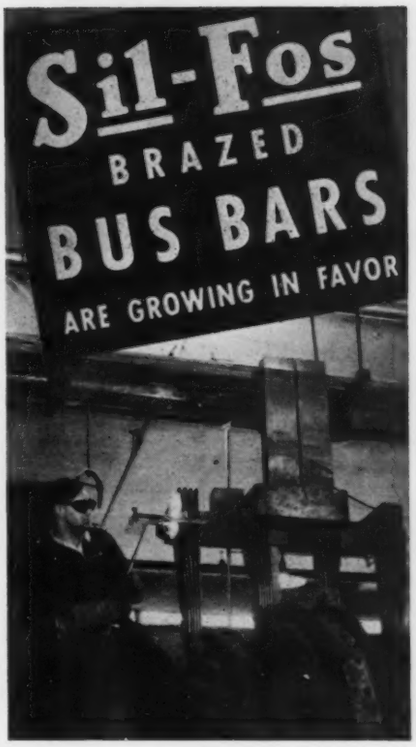
▶ ROBERT W. LEA, resigned as president of the West Virginia Coal & Coke Co., and was elected vice-president of the Johns-Manville Corp. recently. He will be in charge of finance, occupying the position formerly held by Enders M. Vorhees, who has become chairman of the finance committee of the U. S. Steel Corp.

▶ ROSCOE SEYBOLD has been elected to the board of directors of the Westinghouse Electric & Manufacturing Co. Mr. Seybold, who has been associated with Westinghouse since his graduation as an electrical engineer from Purdue University in 1907, has been vice-president and comptroller of the company since 1934.

▶ V. A. SHEALS, for more than 15 years a member of the cable section of General Electric's central station department, has recently been named assistant designing engineer of the cable engineering department. Since 1930 he has been wire and cable specialist for the New York district. In that capacity he



ON one installation after another SIL-FOS brazing of Bus Bars is replacing old methods of clamping, bolting and soft soldering.

Actual results show that SIL-FOS is winning favor because it offers many physical and cost saving advantages.

- SIL-FOS joints reduce electrical resistance.
- The small lap required saves copper.
- Bolts are eliminated—drilling time is saved.
- Joint strength exceeds the bus bars themselves.
- Closer assembly becomes possible —space can be saved.
- A SIL-FOS brazed system is, in effect, jointless. Joints cannot work loose and are immune to internal oxidation—they're permanent and maintenance-free.
- SIL-FOS brazing offers surprising savings in labor costs.

Investigate this modern bus-bar joining method. Full information about SIL-FOS and its application will be sent on request. Engineering cooperation is also offered on specific installation problems. Write us for Bulletin 52-EW and our Bus-Bar Reprint.

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82 Fulton St.
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Agents in Principal Cities
HANDY & HARMAN of Canada, Ltd., Toronto

received a Charles A. Coffin award from the company in recognition of his outstanding contributions to the development of oil-filled cable. Mr. Sheals joined G. E. in 1917.

OBITUARY

▶ EMMETT R. KING, comptroller of the Metropolitan Edison Co. of Reading, Pa., and of the New Jersey Power & Light Co., both in the Associated Gas System, died, as the result of a heart attack, January 8. He was 54 years of age.

▶ PHILIP M. FREEMAN, a construction engineer employed by the J. G. White Engineering Company, New York, died recently at a hospital in Lagunillas, Venezuela. He was born in Plainville, Conn., 48 years ago and was graduated from Sheffield Scientific School at Yale University in 1910. Among his connections during his career were the Youngstown Sheet & Tube Company in Ohio, American Brass, New Departure and Bridgeport Brass companies in Connecticut and the Babcock & Wilcox Company in New York City.

▶ CHARLES R. SKINNER, district sales manager of the Consolidated Edison Company's Westchester Square office in the Bronx, New York, was killed instantly January 26 when an automobile in which he was a passenger skidded on the icy pavement and crashed against a railroad pillar. Mr. Skinner had been associated with Consolidated Edison since 1909.

▶ HUGH SHEPPARD, system supervisor for Montreal Light, Heat & Power Consolidated, and associated with the company for 32 years, died suddenly at his home in Montreal on December 23. Mr. Sheppard was born in Holyhead, Wales, in 1876, and went to Canada in 1905. One year later he became associated with the Montreal utility.

▶ PAUL B. WEBBER, for the past fifteen years associated with the New England Power Association, Boston, as assistant to the treasurer in various capacities, died at his home in Bedford, Mass., December 25, from a heart attack. He was 54 and had been connected with New England utilities since being graduated from M.I.T. in 1906. For some time he was treasurer of the Massachusetts Utilities Associates.

▶ MAJOR CLAYTON W. PIKE, a consulting electrical engineer, who served as chief of the Philadelphia Electrical Bureau from 1912-1916, died December 30, of pneumonia, in a hospital at Southern Pines, N. C. He was 72 years old. Major Pike had broad contacts with engineering and technical societies. He was president of the elec-

And the grandson, too, ... later!

Experience "bred in the bone" is hard to find. But here at Victor you'll see fathers and sons* working side by side at a craft that's older than time . . . ceramics. Perhaps dad is boss of the Bushing Department while the kid is out in the testing laboratory with an E.E. degree behind him. But regardless of the importance of their jobs, if they are Victor men it's a matter of family pride to turn out insulators that we can label "GOOD" and mean it.

*Note: Illustration from an authentic photograph made in our plant.

V *The Mark of a* **GOOD** *Insulator*

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Psychoanalysis

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Even these jaw-breakers get through

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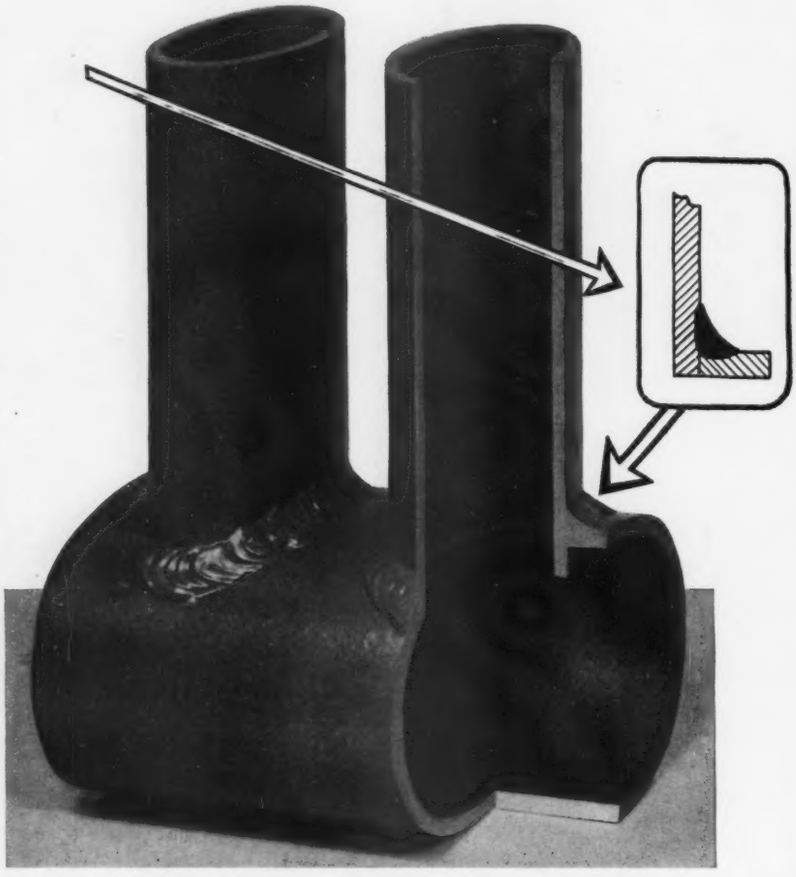
Your Bell telephone will transmit clearly any spoken word, be it short or long. For it represents not only skillful design by Bell Telephone Laboratories, but skillful construction by Western Electric—manufacturing unit of the Bell System.

Every telephone made at Western Electric must pass an electrical test to prove its capacity to faithfully transmit the human voice. This is one of hundreds of tests which your telephone undergoes before it is deemed fit to serve you.

Western Electric ... *made your* **BELL TELEPHONE**

Extra Strong at the weld!



Section of Pennsylvania Transformer Radiator showing heavy wall thickness at the weld

WHEN the tube is welded into the header, a portion of the metal of both is fused with the metal of the electrode. Naturally much of the metal remains unfused, and it is the thickness of this remaining metal that helps support the weld and that determines the *reliability* of the welded joint.

In Pennsylvania Transformer radiators, the tubes are made of 13-gauge steel (almost ⅛-inch thick). This means that the tube is extra strong at the weld—one of many reasons why Pennsylvania radiators are permanently sturdy and trouble-proof.

PENNSYLVANIA TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

1701 ISLAND AVENUE N. S., PITTSBURGH, PA.

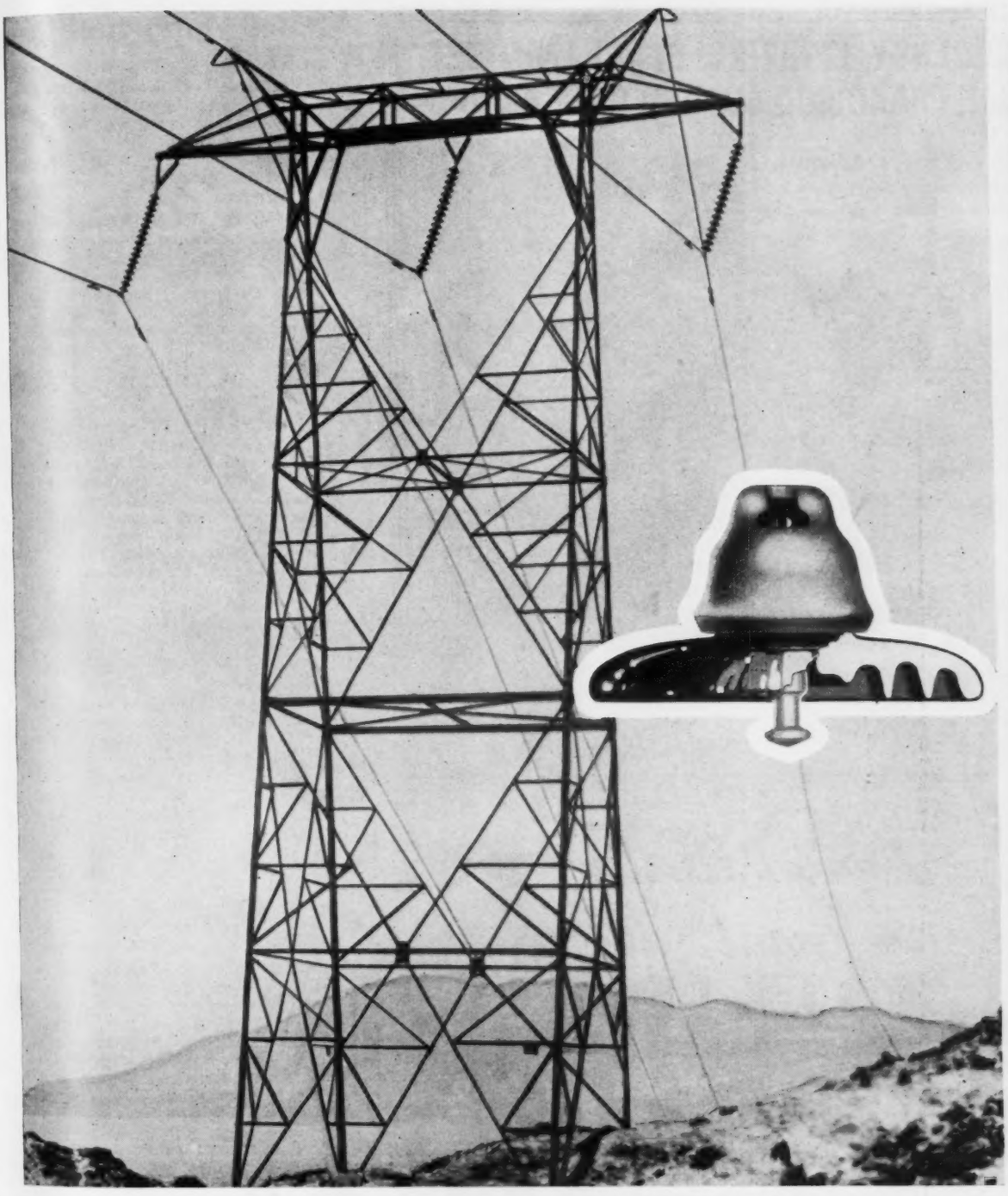
trical section of the Franklin Institute in 1896 and 1897, vice-president of the Society of Municipal Engineers in 1914 and 1915 and head of the Philadelphia section of the A.I.E.E. in 1895. He was the author of books and articles on electrical engineering.

▶ GEORGE G. RAYMOND, designer of the electrical equipment on New York's earliest subways, died, of a heart attack, December 15 at his residence in New Rochelle, N. Y. As a chief electrical engineer for the Interborough Rapid Transit Co. and at other times for contractors, Mr. Raymond designed and installed the transmission circuits and general equipment of subway lines. He installed some of the first turbines at Niagara Falls and took part in the building of transmission lines south from Niagara.

▶ MAJOR JOHN A. WILSON, engineer and adjutant-general of Puerto Rico for 20 years, died December 2, after an illness of more than a week, in San Juan. He was 76 years of age. As one of the original partners in the engineering firm of J. G. White & Company in New York, Major Wilson participated in the construction of some of the country's early utilities before going to Puerto Rico in 1898 to electrify the old Spanish steam tramway which served San Juan.

▶ L. R. SHEELEY, district manager of the Pacific Power & Light Co., at Yakima, Wash., died of double pneumonia, January 16. Mr. Sheeley joined the company soon after its organization in 1910. After serving at various district offices, in 1924 he was sent to Bend, Ore., as superintendent of the company's subsidiary, Bend Water Light & Power Co. When this subsidiary was absorbed and operated as a district of the company, Mr. Sheeley became district manager there until 1929, when he was transferred back to Yakima as district manager.

▶ DR. RENE THURY, well known to electrical engineers as the protagonist of a system of power transmission by high tension direct-current, died recently in Geneva, Switzerland, at the age of 78. He was also known as the inventor of a voltage regulator, which is still widely in use. Dr. Thury established the Compagnie de L'Industrie Electrique, which constructed this regulator and also manufactured the high-frequency generator which was much used in the early days of radio communication. Later Dr. Thury was connected with the Societe Alsacienne de Constructions Mecaniques Belfort. He was elected an Honorary member of the Institution of Electrical Engineers (Great Britain) in 1934.



THOMAS·INSULATORS

THOMAS SUSPENSION-STRAIN INSULATORS AT 230 KV.

THE Metropolitan Water District of Southern California select Thomas Insulators and Line Hardware for 237 circuit miles of transmission line in providing a power supply for its Colorado River Aqueduct Pumping Plants.

This 230 Kv. line is single circuit, three-phase, from Boulder Dam to the District's five pumping plants. Normal suspension strings consist of thirteen Thomas Suspension Units, with dead-ends made up of two fifteen-unit strings. For unusual conditions seventeen units are used in suspension, with two nineteen-unit strings on dead-ends.

Install Thomas Insulators today because their unexcelled performance and greater economy have been proven both in laboratory and in service.

THE R. THOMAS & SONS COMPANY

ENGINEERS - MANUFACTURERS - DESIGNERS

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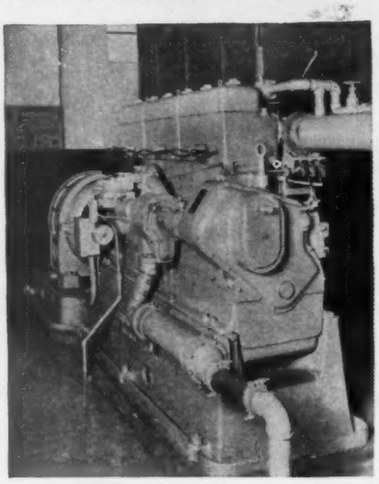
GRAYBAR ELECTRIC CO., INC., Agents

The Pioneer Since 1873

OUR 66TH YEAR

EMERGENCY LIGHTING GENERATOR SET
on **SAN FRANCISCO GOLDEN GATE BRIDGE**

187 K.V.A. 1200 R.P.M. General Electric Generator direct connected to Sterling Viking 6-cylinder 330 H.P. Engine, for standby service.



Sterling — THE ENGINE OF REFINEMENT

Twenty Walland Canal Bridges; The Pennsylvania Railroad; C. R. R. of New Jersey; D. L. & W.; P. L. Bridges at Newark; New York City Triborough Bridge—many of the important lift bridges built in the past 15 years are equipped with Sterling engine generator sets.

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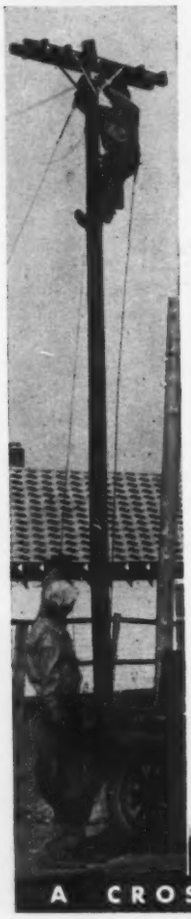

Heavy Duty or Rural, it's
"DIXIE"
DENSE LONGLEAF
POLES

JACKSON LUMBER COMPANY — POLES — DIXIE — PILING — LOCKHART, ALABAMA

Cross-country or rural, "DIXIE" all dense longleaf Poles meet every requirement for strength, straightness and resistance to weather, decay and insects. Properly seasoned. Correctly graded. Available untreated or pressure-treated (Creosoted or "Wolmanized"). Large stocks of all standard sizes for prompt shipment. Let us quote on your requirements.

JACKSON LUMBER COMPANY
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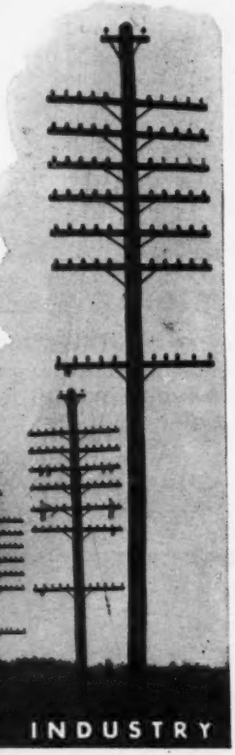


A CROSSETT WATZEK GATES INDUSTRY

Sales Opportunities

BAILEYSVILLE, W. VA. — Appalachian Electric Power Company, Bluefield, W. Va., has plans maturing for extensions in transmission line from Wyoming, W. Va., to Baileysville, Clearfork and vicinity, for power service in latter area. Work is scheduled to begin soon.

GRAND RAPIDS, MICH.—Fisher Body Division, General Motors Corporation, Detroit, Mich., plans installation of motors and controls, transformers and accessories, regulators, electric hoists and other equipment in new one-story addition to metal-stamping plant at Grand Rapids. Also plans expansion of power station at same plant, including installation of equipment. Proposed to begin work in February. Cost estimated close to $1,000,000. E. F. Fisher is general manager.

CHARLESTON, S. C.—South Carolina Public Service Authority, Charleston, receives bids until February 28 for construction of power dam, lock and power station at Pinopolis, where hydro-electric power plant will be located, Santee-Cooper River power and navigation project. F. R. Sweeney is chief engineer. Harza Engineering Company, 27 Charleston Street, Charleston, is consulting engineer. (This part of project is estimated to cost approximately $3,000,000).

EUGENE, ORE.—J. D. Ross, administrator, Bonneville project, Department of Interior, Portland, Ore., receives bids until February 18 for three 4000-kva. power transformers with accessories, for installation in new power substation at Eugene, connecting with transmission line from Bonneville, Ore., hydro-electric generating plant (Circular 138).

TACOMA, WASH.—Department of Utilities plans early call for bids for equipment to be installed in municipal electric power plants and in new power substation, including high-tension switchgear and accessories, low-voltage switching apparatus, transformers and miscellaneous equipment. Fund of $135,000 has been authorized.

MUNCIE, IND.—Indiana General Service Company, Muncie, plans extensions in primary and secondary lines in parts of Delaware, Grant, Madison and Blackford Counties, totaling over 800 miles in all, for expansion in rural electric system, including power substation units and service facilities. Entire project will cost close to $900,000 and will form part of 1939 extension and improvement program of company. Proposed to begin work in spring.

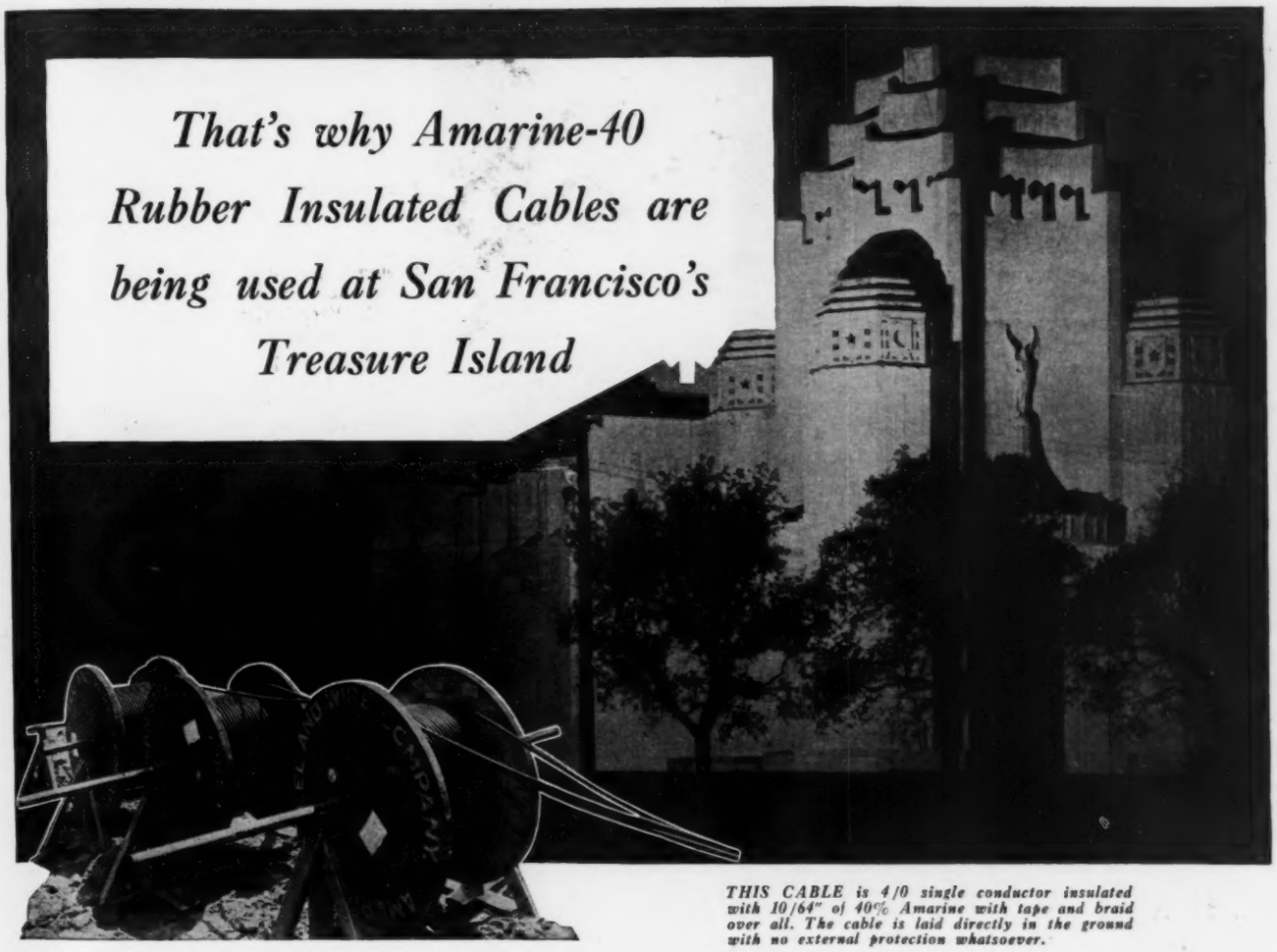
HOSINGTON, KAN.—Is arranging early call for bids for equipment for new municipal electric lighting plant unit and extensions in distributing system. Financing has been arranged. W. B. Rollins & Company, Railway Exchange Building, Kansas City, Mo., are consulting engineers.

SANDUSKY, OHIO—Pennsylvania Railroad Company. Cleveland, Ohio, has approved plans for new power substation at Sandusky, outdoor type, and will begin work soon.

JOLIET, ILL.—Joyce 7-Up, Inc., 12 West Webster Street, Joliet, plans installation of motors and controls, transformers and accessories, conveyors, electric hoists, loaders and other equipment in new one and two-story beverage-bottling plant on Plainfield Road, Will County, near Joliet. Also will install an air-conditioning system in part of plant. Similar equipment will be installed in another one and three-story plant to be erected by company for like service in vicinity of Ashland and 31st

Lovely to Look at . . . but

A MIGHTY TOUGH SPOT FOR BURIED CABLES



THIS CABLE is 4/0 single conductor insulated with 10/64" of 40% Amarine with tape and braid over all. The cable is laid directly in the ground with no external protection whatsoever.

TREASURE ISLAND, the site of the GOLDEN GATE International Exposition is "made land." This beautiful spot was literally pumped up from the bottom of the sea. The soil which composes Treasure Island contains quantities of salt and other deleterious substances. Where could one find a spot that offered tougher conditions for cables to resist?

The Engineers of the Golden Gate International Exposition thoroughly investigated rubber insulating compounds for use in their buried feeders which must supply the various buildings and equipment on Treasure Island. The result was that they specified Amarine 40 or its equivalent and purchased a large quantity for this service.

Amarine-40 is an insulating compound designed especially for cables operating under water without protection of lead or other water-proof coverings. Its outstanding characteristics are low water absorption, low specific inductive capacity, good aging qualities and high insulation resistance. Amarine compound is still serving in some of the earliest installations of non-leaded submarine cable. Its excellent properties were the reasons for the Exposition Engineers' decision to use Amarine-40 for this severe service.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Just Published

FRACTIONAL HORSEPOWER ELECTRIC MOTORS

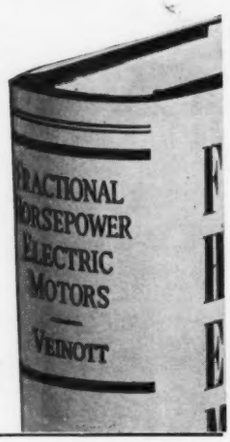
What Kinds Are Available—What Makes Them Run and What They Will Do—How to Repair, Rewind, and Reconnect Them

By CYRIL G. VEINOTT

Design Engineer, Small Motor Engineering Dep't
Westinghouse Electric & Manufacturing Co.

431 pages, 314 illustrations, 22 tables, $3.50

HERE is a practical manual to help you get better service from your small motors. Covers principles of operation, characteristics, construction, and winding arrangements employed in principal types of fractional horsepower motors in use today. Shows how to take performance tests; how to find types and horsepower rating of motor required to drive a motor-operated appliance; how to repair and rewind motors, etc.



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Streets, Chicago, Ill. Proposed to begin work on both plants early in spring. Entire project will cost close to $500,000. Graham, Anderson, Probst & White, 80 East Jackson Boulevard, Chicago, are architects. John Joyce is president.

WAHPETON, N. D.—Otter Tail Power Company, Fergus Falls, Minn., will make contract awards soon for extensions and improvements in Kidder steam-electric generating station at Wahpeton, recently referred to in these columns, and will proceed with project early in spring. Work will include installation of a new 10,000-kw. steam turbo-generating unit and accessory equipment. Cost estimated about $400,000. Extensions will be made in switching facilities, transmission and distributing lines in same area.

CHEHALIS, WASH.—Public Utility District No. 1, Lewis County, Courthouse, Chehalis, G. A. Peters, secretary, receives bids until February 20 for equipment for new electric generating station for power supply for rural electric system. Financing has been arranged through federal aid. Baer & Cunningham, Spalding Building, Portland, Ore., consulting engineers.

LEAD, S. D.—Homestake Mining Company, Lead, plans installation of motors and controls, transformers and other power substation equipment, regulators, conveyors, electric hoists and other equipment in connection with modernization and improvements in milling division at local gold-mining plant, including development of a new shaft. Entire project will cost in excess of $2,000,000.

SLATER, MO.—Receives bids until Februray 18 for improvements in municipal electric power plant and distributing lines, including extensions in overhead lines (Section A); cooling tower (Section B); circulating water pumps (Section C); and switchboard with accessories (Section D). Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

CROSBYTON, TEX.—Has rejected bids recently received for equipment for new municipal electric power plant (Sections 2 and 3), and municipal electrical distributing system (Section 1). New bids are scheduled to be asked at once. Municipal Engineering & Financing Company, Mercantile Building, Dallas, Tex., is consulting engineer.

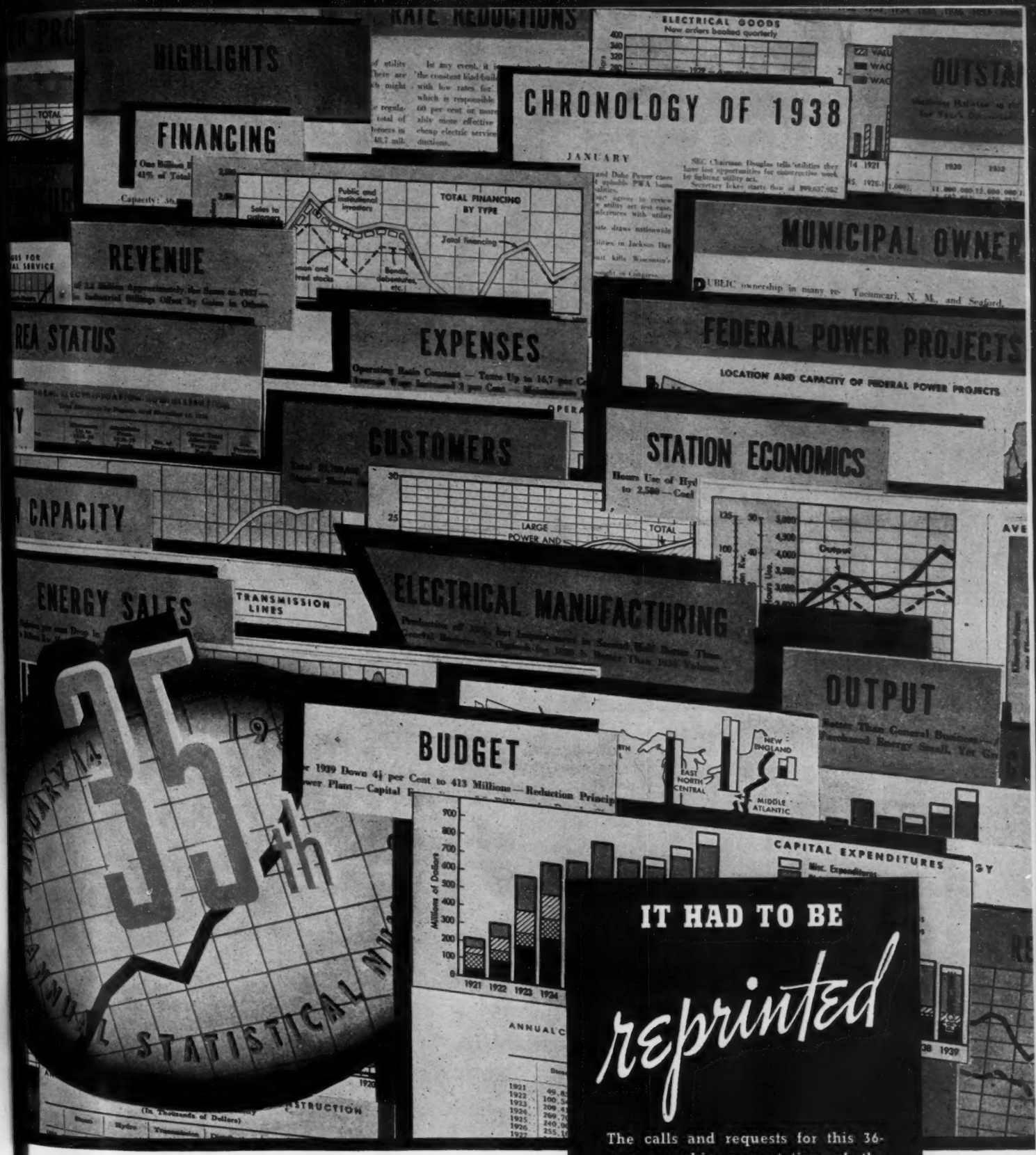
SYRACUSE, N. Y.—Crucible Steel Company of America, Inc., 405 Lexington Avenue, New York, N. Y., plans installation of motors and controls, regulators, conveyors, electric hoists and other equipment in new addition to branch mill on Emerson Avenue, Syracuse, where site has been selected. Cost estimated close to $500,000. Proposed to begin work soon.

LOS ANGELES, CALIF.—Los Angeles Water and Power Bureau has preliminary plans under way for new headquarters building for load dispatching division, on site at First and Boylston Streets, recently selected. It is estimated to cost close to $140,000, including equipment. Engineering department is in charge.

•

City Plant Lets Contract

Palmyra, Mo., has recently awarded a contract for the installation of a generating unit for the municipal light and power plant to McIntosh & Seymour, Auburn, N. Y., at $50,342.



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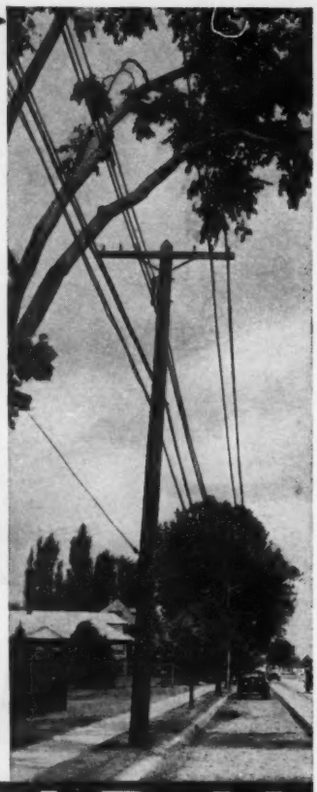

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Recent Rate Changes

WISCONSIN ELECTRIC POWER CO., Milwaukee, has been authorized by the State Public Service Commission to reduce rates to some 25,000 commercial customers $150,000. The rate per kilowatt-hour for the first 250 kw.-hr. of energy used in the metropolitan Milwaukee area was reduced from 3.7 cents to 3.5 cents. In Racine, South Milwaukee and Cudahy, the rate was reduced from 3.95 cents to 3.75 cents, and in other territory served by the company, the decline was from 4.2 cents to 4 cents. The new rates become effective after February meter readings with the 75 cents fixed charge, set in the old rates, retained. The commission also authorized extension of the utility's "10 for 1" plan to July, 1940. Under this plan, customers can use twice as much electricity during any month as was used in the corresponding month of the preceding year at a 10 per cent additional cost.

CHEYENNE LIGHT, FUEL & POWER CO. has proposed to the Wyoming Public Service Commission a reduction in electric rates for Cheyenne consumers totaling $80,150.

ILLINOIS IOWA POWER CO. rate schedules, by which the company offered preferential rates for residential and commercial electric service in Jacksonville, South Jacksonville, Centralia, Central City, Finney Heights, and Wamac to customers contracting to take service from the company exclusively for a period of not less than 5 years were cancelled and annulled by the Illinois Commerce Commission. The board based its action on the ground that no "proper statutory notice of said proposed rate schedules" was given and that, therefore, the proposed rate schedules should be annulled.

MISSOURI PUBLIC SERVICE COMMISSION has announced that utility rates were reduced $2,528.000 during the biennium which closed December 31. By far the biggest share of the 1937-38 reductions, $2,469,652, came in rates of electric companies. The other cuts were in telephone and water charges.

CLARKSDALE, MISS., has announced a reduction in electric rates, partly domestic, but mostly industrial, of about $25 000 annually. The new rates will be based on the actual kilowatt-hours used by the consumer and do not take into consideration room counts, which has been the case heretofore. A savings of approximately $7.000 a year will be brought about to the consumers in the homes and about $18,000 to the industrial consumers. The Clarksdale water and light plant is contemplating improvements that will total approximately $180,000 and it is possible, officials stated, when these improvements are made, further reductions may be made.

•

REA Completes Survey

Announcement has been made by the REA that it is tabulating the results of an electric appliance survey being completed in several Ohio counties. The survey was conducted by a house-to-house canvass of all dwellings, stores and other establishments within ½ mile of the lines of ten REA-financed electric co-operatives. The information was gathered by personal interviews with users and non-users of electricity.

Modern Flexible Power for Brass Rolling Mill

[*Continued from page 46*]

To supply power to individual d.c. machines throughout the entire mill, taps are made from a unique metal-inclosed, self-ventilating, 250-volt, two-conductor overhead bus system designed to carry the extremely heavy currents common to heavy d.c. rolling mill drives.

Capacity range of this bus system varies from 5,000 down to 1,500 amp., the latter being considered the economic minimum size of bus for this particular instance. There is about 360 ft. of 5,000 amp. bus alone, consisting of five 4 x ¼-in. bare copper bars suitably insulated and supported within a perforated sheet metal inclosure.

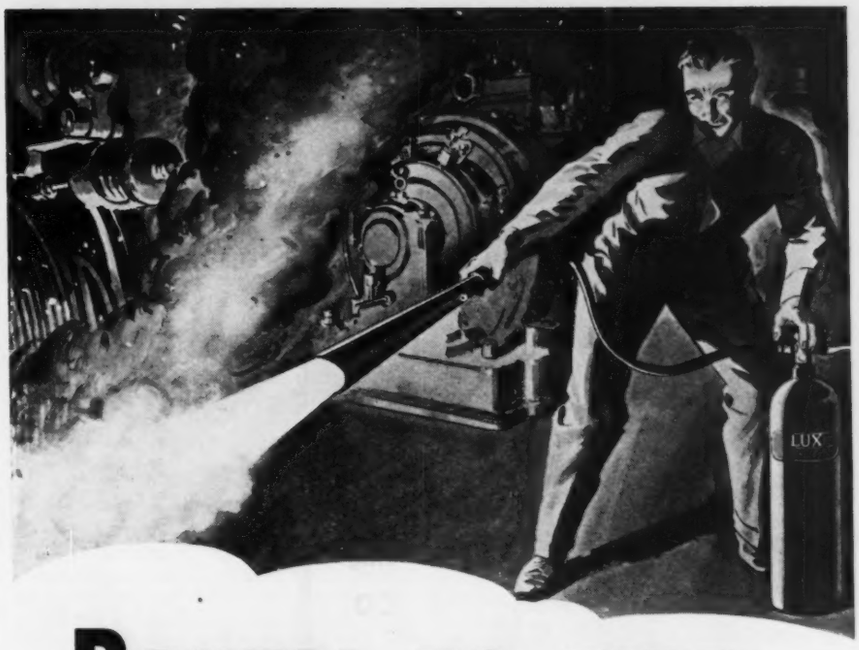
The prefabricated bus was assembled in 20-ft. sections and is provided with flexible braid connections located along the run to correct for expansion and contraction. Suitable fuse connections and blocks are provided where necessary. The method of taking taps off the main bus runs is shown in an accompanying illustration. Where such taps are made or where joints occur in assembly the bus was silver plated at the factory to keep down voltage drop.

The entire power feeder run, including taps, turns, angles, offsets, etc., totals about 2,370 ft.

A.C. distribution

With the single exception of the 6,600-volt supply to the 2,250-hp. synchronous motor driving the motor-generator set at cold breakdown mill a.c. distribution around the mill is at 460 volt. The a.c. distribution cables radiating from the 460-volt bus in the substation are run overhead in 3½ to 4 in. "Transite" ducts and attached to the same racks that support the d.c. bus work. Use of overhead feeder runs in Transite duct combined to reduce considerably the cost of the a.c. distribution and provided a system that could be changed readily.

In addition to the mills already described the electrical system supplies current to a considerable number of existing two-high mills, including one high-speed mill (driven by a 250-hp. variable-speed d.c. motor), completely equipped with electrical screwdowns and a 75-hp. controlled tension device.



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- ☐ Specifications on Linemen's Belts and Safety Straps.
- ☐ The Safety Factor on Linemen's Leather Goods.
- ☐ Pocket Tool Guide.

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Municipal Plants

FLORA, IND.—Citizens voted 382 to 216 at a special election held recently in favor of buying the local facilities of the Northern Indiana Power Co. The election empowers the town board to follow the Indiana statutes in acquiring the properties.

BURKESVILLE, KY.—City officials have abandoned plans for the proposed municipal light, heat and power plant, which was estimated to cost $65,000.

COLUMBUS, MISS.—The federal government has increased its grant made to the city for construction of a municipally-owned electric power distributing system. The grant was increased from $126,000 to $147,640. Mayor Harris said the $21,640 additional would enable the city to carry out its original plan for building the new system. The system will be completed in July.

WAPAKONETA, OHIO—Status of the municipal light plant construction controversy is undetermined following two recent developments—the withdrawal of the $146,000 allocation of PWA funds, and the assignment of the mandatory suit before the Ohio Supreme Court. It was generally believed that the federal grant was withdrawn because of the long-drawn out fight (five years) and the failure to start construction. Some officials believe that new federal funds may be allocated if the Supreme Court rules that the legislation is legal.

•

1938 Hydro Progress Reported by Canada

New water-power installations in Canada during 1938 totaled 135,459 hp., bringing the total for the Dominion at the end of the year to 8,190,772 hp., according to T. A. Crerar, Minister of Mines and Resources.

For the most part the increase consisted of additions to existing stations in British Columbia, Manitoba and Quebec. The more important new developments included 10,200-hp. Cowie Falls development of the Nova Scotia Power Commission on Mersey River, 10,400-hp. plant of the Hydro-Electric Power Commission of Ontario at Ragged Rapids on Musquash River and the 10,000-hp. development of the Great Lakes Power Company at Lower Falls on Montreal River in Ontario.

Progress was also reported in the extension of transmission and distribution facilities. Among the work reported were an 83-mile, 110-kv. transmission line of the Winnipeg Electric Company, 2,400 miles of rural line completed by the Hydro-Electric Power Commission of Ontario and twenty miles of 220-kv. line added to the system of the Shawinigan Water & Power Company. A new rural power district was completed in Queens County, New Brunswick, and will be supplied by the Grand Lake power plant.

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Contracts Approved for New Rural Lines

The Rural Electrification Administration has recently approved the following construction contracts:

COLORADO—San Luis Valley Rural Electric Corp., Monte Vista, W. I. Johnson, superintendent, and C. C. Cox, Amarillo, Tex., engineer, contract to C. E. Atwater Construction Co., Grand Island, Neb., for building another section of the project, 166 miles of line, 349 members; bid $118,033.

GEORGIA—Three-Notch Electric Membership Corp., Donalsonville, C. Lamar Hatcher, superintendent, and J. B. McCrary Engineering Corp., Atlanta, engineer, contract to Roy Richards, Carollton, Ga., for building project, 284 miles of line, 948 members; bid $151,917. Little Ocmulgee Electric Membership Corp., Alamo, J. W. Simmons, Jr., superintendent and J. B. McCrary Engineering Corp., Atlanta, engineer, contract to L. M. Harvey, Pensacola, Fla., for building entire project, 202 miles of line, 580 members; bid $106,726.

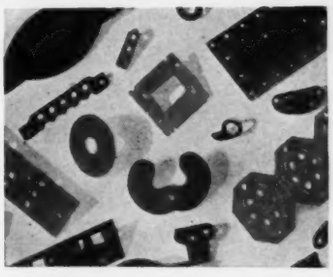
INDIANA—Jay County Rural Electric Membership Corp., Portland, John M. Macklin, superintendent, and Indiana Statewide REMC, Indianapolis, engineer, contract to the Andrews Asphalt Paving Co., Hamilton, Ohio, for building second section, 232 miles of line, 680 members; bid $176,306. Steuben County Rural Electric Membership Corp., Angola, Charles L. Puffer, superintendent and Indiana Statewide REMC, Indianapolis, engineer, contract to Cater Construction Co., Kansas City, Mo., for building first section, 260 miles of line, 770 members; bid $198,191. Wayne County REMC, Richmond, Lester Snyder, superintendent and James C. Ashby, Indiana Statewide REMC, Indianapolis, engineer, contract to Harold Tharp, Fountain City, Ind., for building third section, 180 miles of line, 570 members; bid $143,345.

KANSAS — Brown-Atchison Electric Cooperative Assn., Horton, Edward E. Dorssom, superintendent, and Midwestern Engineering Co., Omaha, Neb., engineer, contract to the Inland Construction Co., Omaha, for building another section of project, 125 miles of line, 194 members; bid $77,099.

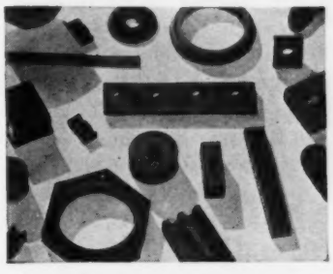
KENTUCKY—Inter-County Rural Electric Co-op. Corp., Danville, J. V. Swaim, superintendent, and Ray W. Chanaberry, Inc., Louisville, Ky., engineer, contract to Codell Construction Co., Winchester, Ky., for building another section, 145 miles of line, 616 members; bid $111,150. Shelby Rural Electric Co-operative Corp., Shelbyville, William C. Dale, superintendent and Ray W. Chanaberry, Louisville, engineer, contract to Henry Bickel Co., Louisville, for building second section, 77 miles of line, 239 members; bid $46,592.

MICHIGAN—Cherryland Electric Co-operative, Lake Leelanau, N. B. Chesbro, superintendent, and Southern Michigan Engineering Corp., engineer, contract to Harris-McBurney Co., Jackson, Mich., for building first section, 302 miles of line, 960 members; bid $261,270.

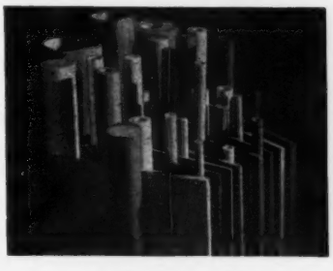
NEW JERSEY—Sussex Rural Electric Cooperative, Sussex, Lester W. Lantz, superintendent, and Clarke Miller, engineer, contract to Day & Zimmermann, Inc., Philadelphia, for building another section of project, 20 miles of line, 48 members; bid $20,127.



Punched Insulating Parts



Machined Insulating Parts



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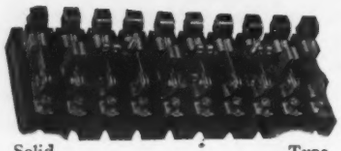

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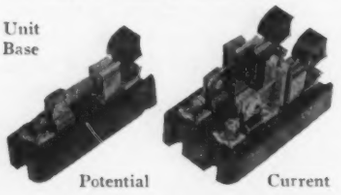

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Are Electric Ranges Profitable?

[*Continued from page 48*]

about costs we might think that there were no errors.

Now as to the service connection. Suppose that 69 per cent of the residence customers use a two-wire No. 8 copper service; 20 per cent use a three-wire, No. 8 service and 11 per cent have a three-wire No. 6 service. Because of multiple dwellings, five customers require only four services. In city districts services may average 88 ft. from pole to house, but in the suburban and rural areas the average may be 111 ft.

Service connections

If a range be installed in a house reached by a two No. 8 or three No. 8 service connection the service is changed to a three-wire service with two No. 6 outside wires and a No. 8 neutral. Here again we have to do some averaging. Suppose that the average service is 100 ft. long and that a three-wire range service costs $11. Suppose, further, that it replaces a two No. 8 service, or less frequently a three No. 8 service, having a weighted average cost of $8.30. We must remember that five customers require only four services. If these assumptions be accepted the increased investment resulting from an adequate service connection will be about $2.20 and the annual cost at 12.69 per cent will be 28 cents a year.

Those customers now equipped with two-wire meters (84 per cent of the total) will have to have a three-wire meter if a range is installed. Suppose that the two-wire meter, including its installation and an increment to cover meters in stock and meter testing equipment, costs $9.57, while a three-wire meter cost $12.20. The difference is $2.63. There are 6 or 7 per cent of the customers who already have three-wire meters but no range, and so we will assume that the extra cost of adequate metering is only $2. Annual costs are high, 21.15 per cent, because testing and the setting and removing of meters is expensive as compared to the investment. The annual cost of the extra meter investment of $2 is 42 cents.

From turbine to meter we have listed and priced the extra equipment which will be needed to supply electric energy to a range. Usually equipment is not installed in small units, but it is in large units, so that one

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range or even a thousand ranges may not occasion the installation of a new turbine. Therefore there is usually part of one turbine as yet unloaded. This condition, however, does not justify taking business on the so-called increment cost basis, charging nothing for turbine capacity because there happens at the moment to be unused capacity on hand.

Now as to billing, servicing, etc. Suppose that the new range is supplied under the residence rate and that no extra meter reading or bill is necessary. Suppose that losses on uncollectible accounts are one-fourth of one per cent. In depression years they will be higher and in good years lower. We must set aside 7 cents a year for bad accounts. The 3 per cent federal excise tax on sales of electricity eats up about 82 cents, assuming that the rate charged is the same as the computed cost, which assumption is only approximate.

Suppose that there are furnished, without charge, replacements of range elements burned out in service and that no charge is made for inspection and minor adjustments when trouble is reported. Suppose that each range requires 0.6 of a new element a year at $3.07 per element and that each range user is responsible for 1.4 trouble calls at 87 cents each. These items total $3.06, as the cost of servicing the range.

Now let us list our suppositions (Table II), remembering that the range consumes 939 kw.-hr. a year and that it produces a diversified group demand of 0.6 kw. at the meter.

Let us consider the first four items whose sub-total is $28.17 a year. They are the cost of power houses, transmission, substations and feeders,

Table II—Summary of Costs Without Allowance for Diversity

Capacity Used in Common by Several Classes of Service	Annual Cost per Range
Turbine capacity	$19.08
Transmission	2.89
Distribution substation	4.55
Distribution feeder	1.65
Sub-total	$28.17
Other Items	
Coal (for 939 kw.-hr.)	$2.16
Extra line transformer capacity	2.91
Three-wire service connection (extra cost)	.28
Three-wire meter (extra cost)	.42
Uncollectible bills	.07
Federal excise tax	.82
Servicing	3.06
Sub-total	$8.82
Grand total	$36.99

Repair Costs Cut 80%

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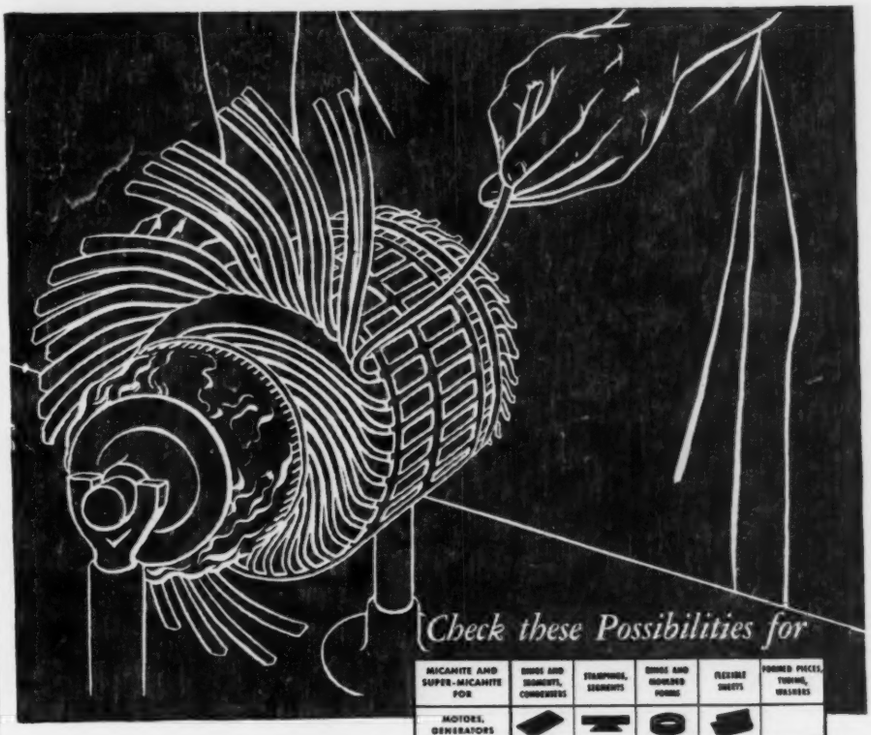

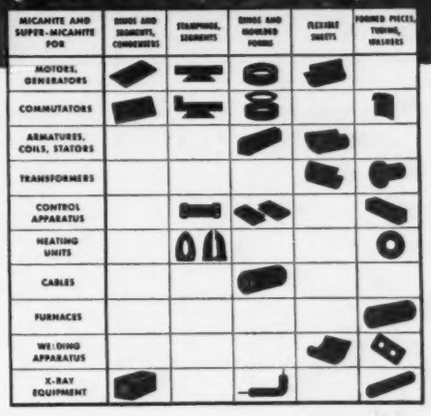

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and they are predominant since they are 76 per cent of the total. The costs as figured make no allowance for the fact that equipment may be used by other classes of service at other times of the day, such as lighting in the later evening or power in the daytime. They are the costs of a central station system serving ranges only. In the jargon of the cost accountant, no allowance has yet been made for diversity.

• In the next issue of ELECTRICAL WORLD Mr. Snow concludes his estimate of the cost of service to the electric range, discussing the effect of diversity, overheads, promotional charges, etc., and the complementary function of the water heater

TVA Settlement Politics

[*Continued from page 71*]

political aims of the White House. Which, as has been explained, have changed economically, at least temporarily, to avoid disaster.

Protesting against additional TVA dams, the Coal Association says:

"TVA's 80-million dollar purchase of the facilities of the Tennessee Electric Power Company, as reported in the press yesterday, adds five hydro power dams and three steam generating plants, heretofore owned and operated by the private company, to TVA's system. In view of this development there is certainly less reason than ever for the construction by TVA of the three additional hydro power dams for which it is currently seeking Congressional approval and which if approved will entail additional expenditures of 166 million dollars out of the Federal Treasury.

"The interest of the bituminous coal industry in this situation is because our industry stands to lose a quarter of a million tons annually at a minimum in consequence of TVA's acquisition and prospective shut-down of these steam plants. This is something over which we have no control, but the fact remains that if more TVA hydro power dams are hereafter created it will aggravate a situation that from the standpoint of the coal industry is already tragic. The victims of this situation are the thousands of coal miners and railroad employees whose jobs will be permanently destroyed by the permanent displacement of this coal tonnage."

A.I.E.E. Report

[*Continued from page 58*]

on any overhead line except in cases of rather low power factor." Also, "it is somewhat doubtful . . . if a number of small units located at meter boxes could ever be justified."

Capacitors and Automatic Boosters for Distribution Circuits—By LEONARD M. OLMSTED (Duquesne Light)

Substantial savings in cost of maintaining proper voltage on 4 kv. circuits possible by use of fixed shunt capacitors (to limit established by p.f. and light load voltage), followed, when additional correction becomes necessary, by one set of automatic boosters beyond the capacitors or by extension of single-phase tap from near the feeding point. Also, unwise to use too many auxiliary regulating devices before replacing with No. 1/0 or No. 4/0 conductors in heavier-loaded portions of circuit. Low voltage on three-phase portions corrected by means of three-phase, four-wire shunt capacitors of 90-180 kva., followed (as also for single phase) by 5-kva. automatic boosters.

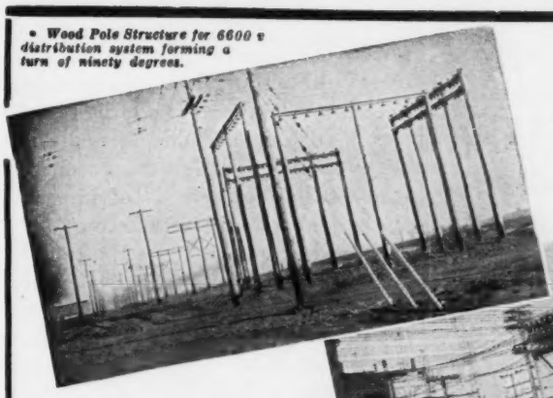
Discussion

Experience showing that use of counterpoises influence line operation through reducing tower footing resistance was cited by S. K. Waldorf (Pennsylvania Water & Power) in discussing the report of the lightning and insulator subcommittee. As many as eight counterpoise wires in parallel have been used by his company, but this has been cut to six in parallel recently. Brief operating records of two similar transmission lines, one with a single and the other with two overhead ground wires, was cited to show that one wire is as good as or better than two.

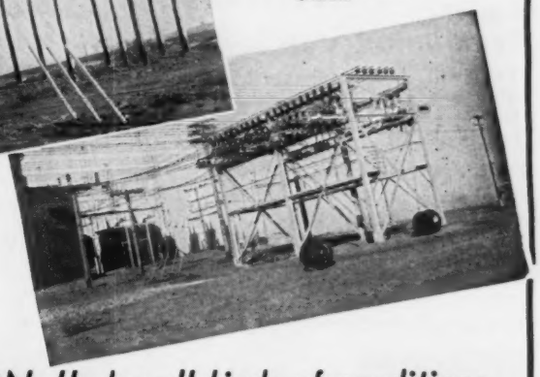
E. R. Whitehead (Duquesne Light) showed that analysis of lightning performance of a 66-kv. transmission ring of his company on which trip-outs per 100 mile-year ranged from 3.97 to 56.8 gave results at variance with experience. When the ground wire shielding factor was calculated and properly taken into effect it was found possible to check line performance closely. Less than perfect ground wire shielding was believed due to the ground wire being close ($3\frac{1}{2}$ ft.) to the top conductors in a number of instances where towers had been changed from suspension to strain.

S. B. Crary (General Electric) found the ability of a system to pull together after being closed in out of phase a factor of considerable importance favoring the reclosing principle. Relaying should not be too

• Wood Pole Structure for 6600 v distribution system forming a turn of ninety degrees.



• Steel Switching Tower erected at Fort Peck, Montana



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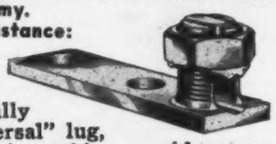

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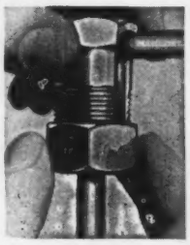

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sensitive or operate during the out of step or pulling into step process. Factors allowing systems to be resynchronized are amenable to analysis.

D. C. Prince (General Electric) enumerated the methods of improving system reliability including: (1) Overhead ground wires, (2) grounding, (3) Petersen coils, (4) expulsion gaps, (5) high-speed reclosing. He pointed out that the last-named method required more study before results could be realized. In closing the discussion of his paper Sporn reported that thirty installations of high-speed reclosures are being made on the American Gas & Electric systems.

Switching Transients

Transients by Switching and Faults—By R. D. Evans, A. C. Monteith and R. L. Witzke (Westinghouse)

Transient voltages due to faults and switching deserve renewed attention. Typical system set-up studied by klydonograph and a.c. network calculator for (1) arcing grounds, (2) de-energizing an unfaulted line section, (3) with fault on one phase, (4) on two phases. Reviews and extends theory of intermittent arcing to account for higher maximum transients. Highest obtained with ungrounded system. Largely avoidable by grounding or Petersen coil. Unless Petersen coil is short-circuited for the cases of de-energizing faulted lines their transient voltages are relatively high. Solid grounding gives lowest transient voltages in general.

Voltage Recovery Characteristics — By Harold A. Peterson (General Electric)

Analysis of recovery voltages imposed on protector tubes. Important factor is angle of fault application. Finds crest recovery voltage for solidly grounded system 1.5-1.75, neglecting tower footing resistance. Neutral grounding R decreases maximum overshoot; X increases the time to crest. Curve gives helpful data for selection of tubes for solidly grounded systems.

Overvoltages During Faults—By Edith Clarke, S. B. Crary and H. A. Peterson (General Electric)

Conclusions drawn for results discussed in paper (1) Line-to-ground faults for most systems can be used as a basis for determining the maximum fundamental frequency and transient voltages during faults; (2) if a system is solidly grounded or grounded through reactance the fundamental frequency voltages-to-ground on the unfaulted phases at the fault will not be greater than 1.73 times normal line-to-neutral voltage; (3) if a system is grounded through resistance they will always be less than twice; (4) the transient overvoltages during faults are not expected to be of sufficient magnitude to cause breakdown of good major insulation.

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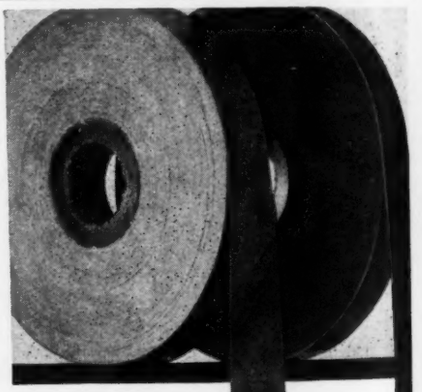

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Effect of Restriking on Recovery Voltage —By C. CONCORDIA and W. F. SKEATS (General Electric)

Clearing immediately after restriking, because of high-frequency components, may originate voltages higher than normally associated with the recovery transient. Systems grounded through neutral reactors are prone to this. Recommended that reactors either have low values (to keep zero sequence reactance down), be in tune with line capacitance to ground, be critically damped by shunting resistance or restriking must be prevented by rapid build up of dielectric strength or by circuit damping.

Influence of Resistance on Switching Transients — By R. C. VAN SICKLE (Westinghouse)

Presents mathematically and graphically effects of various values of R on closing and opening transients of typical a.c. circuits with L and C. Treats single-phase circuits having voltage source uninfluenced by the transients. Charts helpful in choosing suitable damping factors. Resistors can be used (at the expense of simplicity in construction) to increase interrupting ability in design of circuit breakers.

Discussion

C. L. Gilkeson (E.E.L.) raised the question as to whether faults in confined space, such as cable failures, bushing failures or arcs under oil or in expulsion tubes, have the asserted characteristics of dielectric recovery (Evans, Montieth and Witzke paper), namely, that the dielectric strength increases between successive restrikings of the arc. In this connection records of a study of overvoltages conducted by the joint subcommittee on development and research of E.E.I. and Bell System were cited showing that for faults in confined space the arcs were extinguished and restruck every half cycle, every cycle or at irregular intervals, and restrike appeared to be controlled by fundamental frequency voltage, occurring at or near the crest of the voltage wave. In no case did the restrike occur at a higher voltage than normal crest value. While these data do not indicate an increase in dielectric strength between successive arcs, they do not preclude this possibility.

Need for a symposium on "scrambled" systems and a campaign for metering equipment to give better records during times of system "scrambling" was urged by F. W. Gay (Public Service Electric & Gas). He believed that almost the only help a system can expect during "scrambling" will have to come from the generators themselves. It will, he believed, be necessary to jack up their

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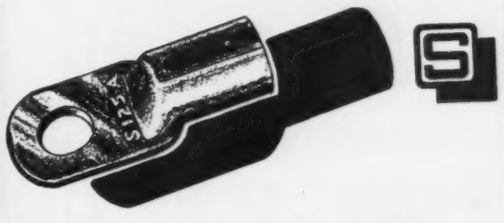

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field strengths and studies should be made to discover how fast it should be done and how far it should be carried.

J. A. Adams (Philadelphia Electric) said that as a result of actual tests on two units, one grounded through a neutral reactor and the other through a grounding resistor, the reactor was replaced by a neutral grounding resistor, with resulting reduction of overvoltages.

Instruments and Measurements

An Automatic A. C. Potentiometer for Non-Destructive Insulation Testing—By GEORGE KEINATH (Consulting Engineer)

A.c. potentiometer equipped with "zero" motor (induction disk) actuated through an amplifier enhancing the unbalance across the bridge diagonal. Fast enough in automatic functioning to give continuous record of p.f. and capacitance which reveal small sudden changes (associated with partial breakdown), but seldom detected by spot readings. Several European manufacturers are using the device in their test rooms; utilities are using to test high-voltage equipment before installation.

Aluminum-Nickel-Cobalt Brake Magnets for Watt-Hour Meters—By STANLEY GREEN (Duncan Electric)

Application of new high-coercive Al-Ni-Co permanent magnet steels to watt-hour meters requires complete redesign of damping units. Permanency in the new design, great savings in weight and space, more resistance to transient magnetic disturbances than predecessor chromium-steel magnet damping are gains from the advance. Typical percentage analysis is aluminum 12, nickel 20, cobalt 5, iron 63.

Demand Meter Time Periods—By P. M. LINCOLN and R. R. SPROLE (Cornell University

For consideration in prospective revision of code for electricity meters, paper pleads for standardization of time period for all maximum demand measurements (now in practice, ranging from one minute to one hour). Discusses correlation of block and thermal demand wattmeters. For latter recommends adoption of time to arrive at 81 per cent of final reading as nominal time period. For all demand meters (thermal or otherwise) recommends 30-minute demand period as standard.

Discussion

H. R. Richardson (Consolidated Edison of N. Y.), although finding the records of the trend and variation of power factor and capacitance with voltage and temperature as obtainable from apparatus like Keinath's interesting, questioned its significance, especially in the case of oil or compound-filled cables or bushings where small localized trouble spots are self-healing. F. C. Doble (Doble Engineering) pointed out that experience with 10-kv. insulation testing shows that, properly applied, it will disclose faults that higher voltages will not show.

L. J. Berberich (Westinghouse) felt that the results given by the Keinath potentiometer may give falsely disparaging indications of the state of insulation. A. J. Williams (Leeds & Northrup) pointed to the possibility of errors from harmonics in the amplifier circuit since it is balanced only for the fundamental frequency.

In the discussion of Lincoln's paper on demand meter time periods A. J. Allen (Consolidated Edison of N. Y.) stated that in recommending a particular load-time curve as a single standard for thermal demand meters a greater step was taken than is justified by the evidence. He pointed out that differences in load measurement between lagged demand meters as a class and integrated demand meters as a class are more pronounced than the difference between the two lagged demand meters having different characteristic curves, one reaching 81 per cent and the other 90 per cent of final indication in a demand interval.

H. M. Witherow (General Electric) felt that it was of major importance to obtain reasonable agreement on the more usual type of load where peaks are sustained for longer periods than to put emphasis on the short time loads. He pointed out also that practical considerations of the time to test logarithmic average meters was of importance in setting the demand period.

•

Woodpeckers Peck Poles

Woodpeckers are causing considerable damage to the poles of Indiana Public Service Corp., with company officials looking for a solution. Recently an expert from Texas looked over the problem, but offered no remedy. Creosote was used, but it seems the birds pecked away at the poles and when the cresote got too strong they flew away to clean their bills on the grass and returned again to peck away. Rotten or sound poles are all the same to the woodpeckers as proving grounds.

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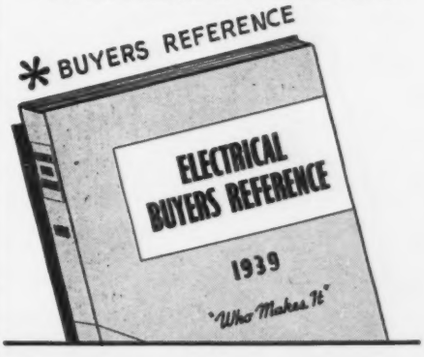

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Positions Wanted (full or part-time salaried employment only), ½ the above rates, payable in advance.

(*See ¶ on Box Numbers*)

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our New York, Chicago, or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page. *Contract rates on request.* E.W.

Copy for New Advertisements Received Until Monday 10 A. M. for the Following Saturday's Issue (*published every other week*)

POSITIONS VACANT

(See also "Selling Opportunities Offered")

ENGINEER WANTED. Experienced in detail design of electric cranes, hoists and structures with not less than 10 years experience in this line. State fully, experience, age, salary expected, etc. P-583, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

ENGINEER WANTED 30 to 35 years of age thoroughly familiar with distribution system, design, and maintenance. Should have had some experience in transmission line and station work. Location Utility in Southern States. P-584, Electrical World, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly, organized advertising service of 29 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo, N. Y.

EXECUTIVES AND TECHNICAL MEN. Contact employers for positions through our confidential and effective methods. We negotiate preliminary overtures. Established 24 years. Inquiries invited. H. H. Harrison, Director, The National Business Bourse, 20 West Jackson Blvd., Chicago.

POSITIONS WANTED

(See also "Selling Opportunity Wanted")

ENGINEER SUPERINTENDENT 16 years experience, design, construction, operation, Diesel, Hydro, steam plants and systems. Familiar public relations, industrial problems seeks new connections Superintendent Municipal System. PW-574, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

ELECTRICAL ENGINEER: 6 years experience construction and maintenance of stations, and transmission and distribution system. Desires new connection with utility, contractor, or manufacturer. PW-585 Electrical World, 520 N. Michigan Ave., Chicago, Ill.

BECOME AN EXPERT METERMAN

Now is the time to plan for the rapidly increasing demands of meter departments.

Central Stations everywhere must have thoroly trained men to efficiently handle meter and instrument work. Whether you have a grade school education or a degree in E.E., you can profit as a meter Specialist.

HOME-STUDY COURSE

Up-to-Date Study Course trains you thoroly at home from mathematics of elemental electricity to full understanding of all types of meters, demand meters, instruments, relays, single and polyphase testing, repairing, calibration, maintenance, etc.

Endorsed by Meter Officials Everywhere.

Low Cost—Easy Terms—Diploma Granted
Write Today for Free Booklet!

Ft. Wayne Correspondence School
Dept. 12, Fort Wayne, Ind.

TRANSFORMERS

LARGE STOCK **PROMPT DELIVERY**

3—750 KVA, ALLIS-CHALMERS Transformers, 22,000/13,200 Volts, 25 Cycle, Single Phase
WE REWIND ALL MAKES AND TYPES—ALL TRANSFORMERS GUARANTEED
3530-34 W. Pierce Street MILWAUKEE, WIS.

ALBERTSON ELECTRIC COMPANY
3530-34 W. Pierce Street Established 1910 MILWAUKEE, WIS.

(POSITION WANTED)

Electrical Distribution Engineer

- Desires responsible position with public utility, consultant or industrial, where 18 years previous experience in those fields may be best applied.
- Experience includes supervision of design and construction on overhead and underground systems. Also appraisal and depreciation surveys. Age 38.

PW 576, Electrical World,
330 W. 42nd St., New York City.

POSITIONS WANTED

SWITCHBOARD OPERATOR with 17 years experience operating large central station switchboards and benchboards. Remote control with both General Electric and Westinghouse controls and switches. Married. Age 39. PW-589, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

ELECTRICAL ENGINEER broad experience. Power Plant, Substation Centre, N. Y. Transmission, and distribution design, estimates, specifications and cost analysis for utility companies. Desires connection with operating company or consultants, available on short notice, married, New York State License. PW-593, Electrical World, 330 W. 42nd St., New York, N. Y.

SELLING OPPORTUNITIES
OFFERED—WANTED
Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITIES OFFERED

OLD ESTABLISHED MANUFACTURER of electric motors and generators has permanent position open for Sales Engineer with experience and proven recent selling. SW-590, Electrical World, 330 W. 42nd St., New York, N. Y.

EXCELLENT OPPORTUNITY AVAILABLE with large pole line equipment manufacturer, for man experienced in the use of hot line tools on distribution and transmission lines. Some college training desirable. Prefer electrical engineer with selling and demonstrating ability. SW-588, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

WANTED
Salesmen & Engineers

Require several salesmen and engineers, well versed in designing distribution and power transformers. State experience and give all information.

Moloney Electric Company
5390 Bircher St. Louis, Mo.

J. P. MANYPENNY
212 N. 21st St., Phila., Pa.
Rebuilt
OIL CIRCUIT BREAKERS

65,000 KVA Interrupting Capacity

2—Westg.	type B-13,	300 amp,	15 KV.
3—Westg.	type B-13,	600 amp,	15 KV.
1—G. E.	type K-132B,	800 amp,	15 KV.
5—G. E.	type K-132B,	400 amp,	15 KV.
3—Condit	type D-22,	400 amp,	15 KV.

Manually or electrically operated

Your inquiries solicited

WANTED

WANTED
MOTOR GENERATOR SETS AND ROTARY CONVERTERS

We will buy outright for spot cash motor generator sets and rotary converters from 300 to 1000 K.W. 250-275 volt D.C. 2300 to 6600 volt A.C. Mail us your list of surplus equipment.

COAL MINE EQUIPMENT SALES CO.
Office and Warehouse Terre Haute, Indiana

OPPORTUNITIES OFFERED

SALES ENGINEER for negotiation Department old established manufacturer of electric motors and generators. Prefer man with experience motor application work. SW-591, Electrical World, 330 W. 42nd St., New York, N. Y.

SALES ENGINEER with Testing Department training. Must be young and willing to work. Old established manufacturer of electric motors and generators. SW-592, Electrical World, 330 W. 42nd St., New York, N. Y.

OPPORTUNITY WANTED

POWER SALES ENGINEER, technically trained, utility power sales, engineering and operating experience, desires new connection. Now employed. References. SA-594, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

WANTED

ANYTHING within reason that is wanted in the field served by Electrical World can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.